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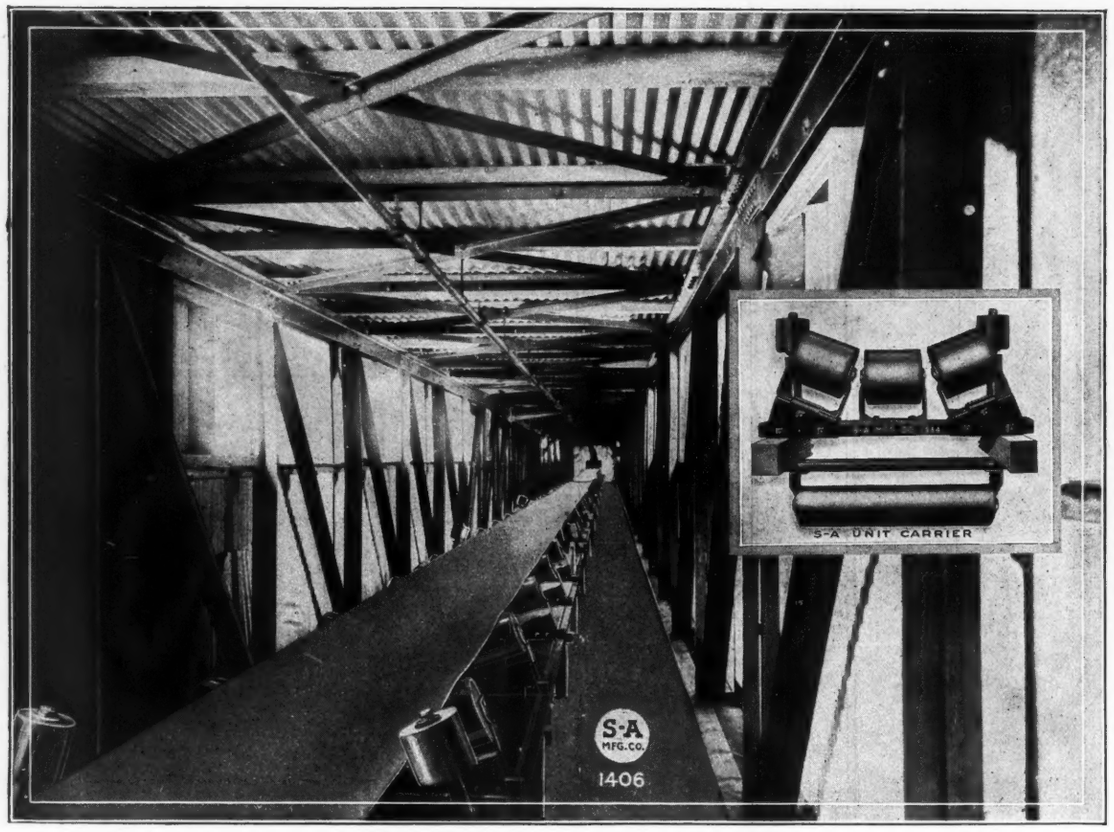

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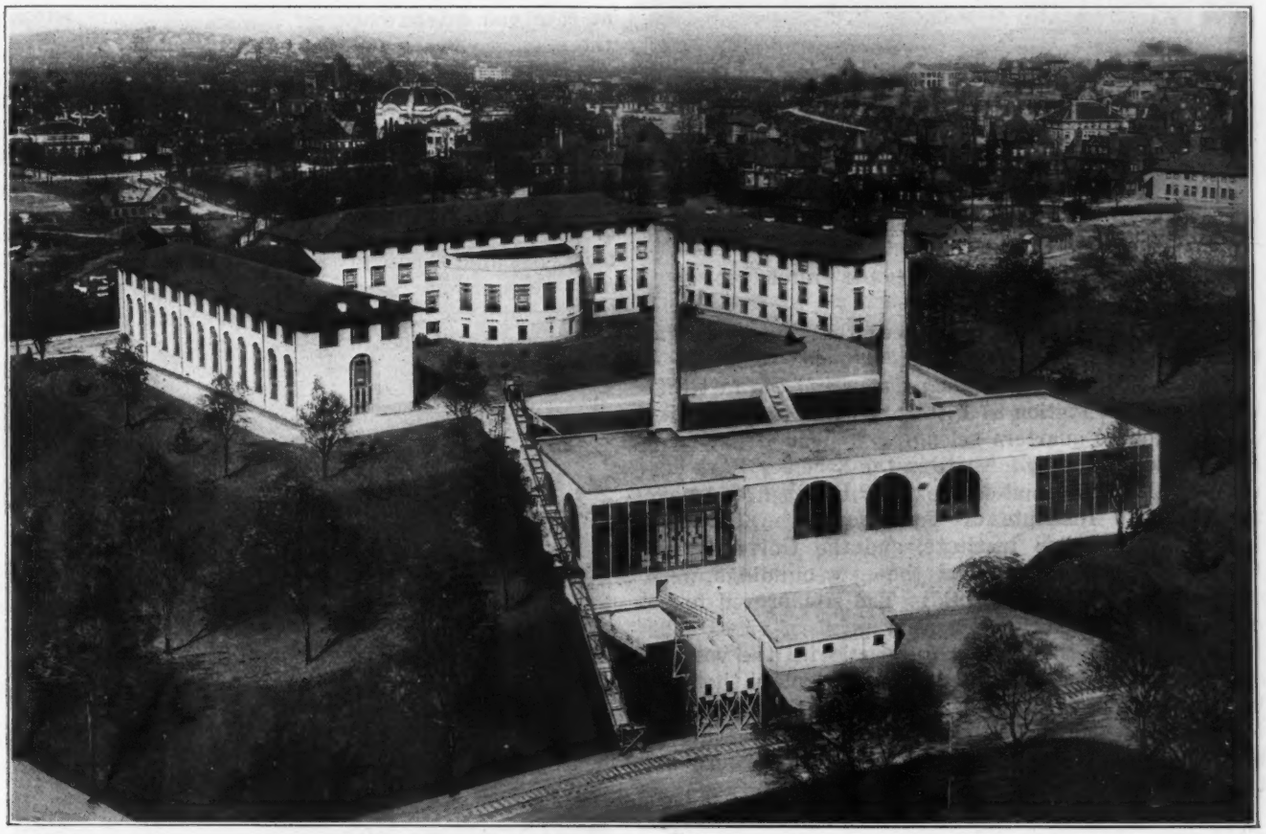


THE PITTSBURGH EXPERIMENT STATION OF THE BUREAU OF MINES, WITH POWER PLANT IN THE FOREGROUND

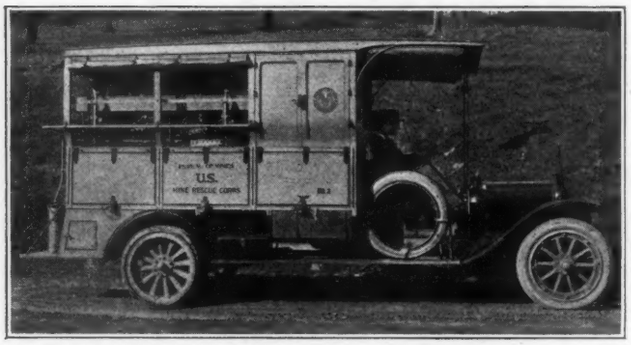
The Pittsburgh Bureau of Mines Experiment Station

A brief history of the work which was initiated in 1904 in connection with the testing and analysis of fuels, and which was expanded to cope with the needs that developed, and ultimately led to the erection and equipment of the Bureau of Mines experiment station at Pittsburgh, Penn. Details of the scope of the work and the result of several years' intensive research are given.

THE work of the experiment station of the Bureau of Mines originated in an exhibit dealing with the testing and analysis of fuels at the Louisiana Purchase Exposition in 1904. The work proved so successful, and its utility was recognized to such an extent, that Joseph A. Holmes was placed in charge in 1905. Extensive testing was undertaken in connection with the physical properties of coal; and, later, the work was extended to include structural steel. The growth of these operations and the ramifications of the work led to the establishment of a branch of the U. S. Geological Survey, for the special purpose of testing fuels and materials, with Mr. Holmes in charge. The equipment and investigations were then moved to Jamestown, Virginia.

The work at Pittsburgh was begun before the Federal Bureau of Mines was established, and, by an arrangement with the War Department, a part of the arsenal grounds, on Butler St., was loaned for the purpose. Operations at the beginning centered around experimental investigations and the collection of data in an endeavor to prevent accidents in coal mines. Exhaustive tests were made on the properties of coal dust; and full-scale operations were carried out at an experimental mine at Brucetown, 13 miles south of Pittsburgh. The results were of considerable value in the prevention of

mine accidents, the insurance of safety, and the provision of adequate "first aid." The many disasters in coal mines in 1907 directed attention to the need for immediate action. The work that had already been done was seen to be entirely justified, and it was then realized

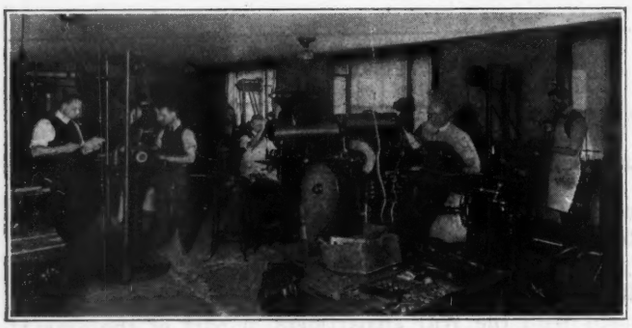


U. S. BUREAU OF MINES RESCUE TRUCK, NO. 2

that there was an imperative need that the investigations should be continued on an extended scale.

The need for the further expansion and the fact that the experiment station at Pittsburgh was in temporary and inadequate quarters belonging to War Department necessitated a change. A site in the Schenley Park district, in the residential section of Pittsburgh and near the Carnegie Institute of Technology, the Carnegie Museum, the Mellon Institute, and the University of Pittsburgh, was chosen, and the new buildings were completed in September, 1917. The site proved to be eminently satisfactory from every point of view. The juxtaposition of the new laboratories with the various state organizations facilitated that coöperation that has been so marked a feature of the work of the Bureau of Mines, and which has resulted in the notable achievements which have developed as a result of the coördination of experience and research.

The Pittsburgh experiment station, which, incidentally, serves as a memorial to the personality and work of the late Joseph A. Holmes, is now the headquarters of the investigation work of the Bureau of Mines. Other stations have been established in other states, according to the demands for specialized local investigations or assistance. These operations are, however, all directed from the Pittsburgh station, and are under the general



INSTRUMENT SHOP AT THE BUREAU OF MINES PITTSBURGH EXPERIMENT STATION

superintendence of Dorsey A. Lyon. With the establishment of the new Eastern station, an extensive and ambitious program was projected. The work was planned to include an analytical study of coal mining in all its branches, the development of a system which would provide adequate provision in the event of mine accidents, intensive research into all phases of "first-aid" and mine rescue work, the testing of explosives, the investigation of more efficient utilization of the country's supply of coal, and the metallurgy of iron and steel.

The buildings of the new station comprise complete and extensive laboratories. The main building is three stories high and has a frontage of 332 ft. Two wings at each end extend back for a distance of 211 ft. and the entrance is surmounted by a monolith in concrete. An auditorium seats 228 persons, and is equipped with every facility for demonstration.

Ample space has been provided to allow for future expansion. The building contains the entire administration office, a library and reading room, computing and draughting rooms, extensive provision in the way of photographic, dark room and motion-picture equipment, machine shops, instrument rooms, test rooms for mine rescue work, engineering and mechanical laboratories, and a complete division for chemical and physical research. An excellent cafeteria for the staff and other

A BOMB-PROOF WHERE THE RATE OF DETONATION OF EXPLOSIVES USED FOR MILITARY OR MINING PURPOSES IS DETERMINED

employees is provided on the top floor. The power house is in a separate building, situated at a lower level than the main building; and tunnels have been driven to house the mains for the supply of power, steam, and compressed air to the various departments of the experimental station.

A feature of the work in the mining section to which adequate attention has not, perhaps, been directed heretofore is comprised in the investigations into the question of mineral waste in coal-mining operations. From the year 1820 to as late as 1870 the wasteful methods practiced at coal mines in the United States were such that only one-quarter of the coal in place found its way to the market. Mining methods were so unsatisfactory and uneconomical that, in some cases, more than half the coal was left in the ground. In addition, there were extensive and avoidable wastages on the surface. The need for stricter economy in operation, both on the surface and underground, was an incentive for the initiation of a scheme which had for its purpose the teaching of economical and efficient methods in coal mining.

The investigations into the question of coal mining generally and the experimental mine tests are under the control of J. W. Paul, chief coal mining engineer. Mine safety and mine rescue work is in charge of a mine safety engineer, D. J. Parker. This department has rendered signal service at mine disasters. Miners are

A PART OF THE MECHANICAL LABORATORY DEVOTED TO THE DETERMINATION OF THE PHYSICAL PROPERTIES OF METALS

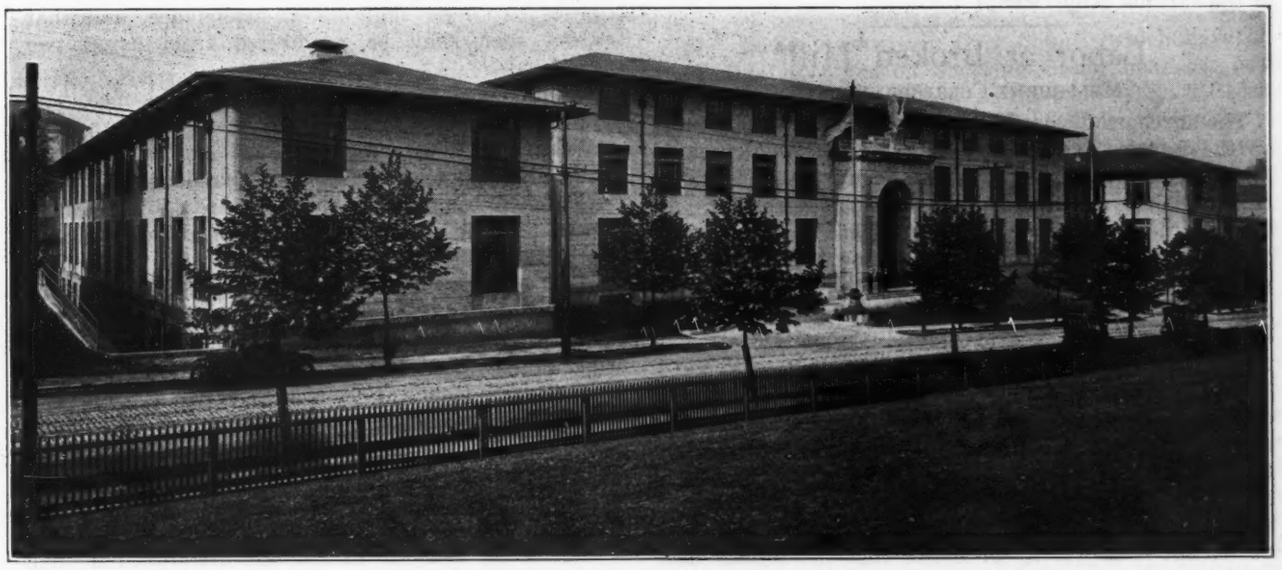
trained in safety methods, and complete provision has been effected with regard to atmosphere, obstacles, and other unusual conditions that may be encountered underground, and the training is thoroughly practical and of far-reaching utility.

In addition to the work outlined that is done at the station, arrangements are made to hold periodical meets in the field for "first-aid" work, and these have proved of immense value. Auto trucks are held in readiness for instant dispatch to the scene of an accident, and constitute an excellent insurance against loss of life underground from preventable causes. The safety truck is equipped with resuscitating apparatus, safety lamps, oxygen cylinders, stretchers, and "first-aid" supplies, and is manned by men who have been specially trained and are thoroughly experienced in the work.

At the experimental mine at Brucetown a large amount of valuable research has been carried on, and the investigations have led to the adoption of several improvements in mine safety work. It was here that the tests were held which resulted in the adoption of stenches to warn miners underground of impending danger. By the use of such compounds as butylmercaptan or isomercaptan, which were, by an ingenious arrangement, supplied to the compressed air mains, immediate warning was given. Whether working at pump or drill, the miner receives an early alarm, and has an opportunity to reach a place of safety.

The work at the experimental mine has included large-scale tests on the characteristics of coal dust, and the effect of moisture variation. Experiments have been made with rock-dust barriers which are automatically formed when shelves containing the material are tipped by the force of an explosion in the mine. It has been demonstrated that the wall of material formed is an effective barrier against the spread of the danger. Troughs have also been developed which discharge a thin sheet of water, and other miscellaneous investigations have been carried out.

The general testing work at the plant in the mining section has included an investigation which has already proved the worthlessness of a number of the so-called fuel-saving powders that are on the market, and a bulletin is to be issued soon. It was at the Pittsburgh station that the Gibbs mine rescue apparatus was developed and perfected. Extensive facilities also exist for the testing of mine equipment, particularly with reference to its possible harmfulness in connection with mine explosions. A quantity of electrical apparatus is being regularly tested, and when found satisfactory is passed for use in mines.



FRONT VIEW OF THE U. S. BUREAU OF MINES EXPERIMENT STATION AT PITTSBURGH

The explosives section is in charge of S. P. Howell, and the equipment includes a ballistic pendulum, a Mattegang recorder, as well as large and small impact machines. The facilities provided for research and experimentation include four instrument shelters and three bomb-proofs. The work recently carried out in-

cludes much that was of distinct value to the Government during the war period. In addition to the general testing of explosives and detonators, there are excellent facilities for the study of the physical characteristics of explosives and the composition and quantity of gases evolved.

The work performed at the chemical research laboratories, in charge of A. C. Fieldner, supervising chemist, includes investigations and analyses relating to petroleum, natural gas, mine gases, industrial gases, explosives, coal, coke, and peat. The petroleum section, in charge of E. W. Dean, is engaged on investigations relating to the more efficient utilization of the petroleum resources of the country, including the testing and inspection of fuel oil for the Government, and more especially the study of various methods of cracking petroleum and increasing the yield of gasoline.

The analytical section, in charge of W. A. Selvig, makes the necessary chemical analyses and other determinations in connection with fuel-testing investigations, the examination of mine gases, mine-explosion investigations at the experimental mine, and other experimental work. The general research section, in direct charge of the supervising chemist, is subdivided into research units, covering the general field of fuels, gas masks, and respirators, mine and industrial gases, natural gas, microscopy, explosives and physico-chemical measurements. One of the new lines of work in this department is in adapting the Army gas mask to industrial needs and approving it for specific uses.

The metallurgical section, in charge of F. B. Foley, has done an extensive amount of metallographic work, particularly in connection with the structure and properties of nickel, tungsten, and molybdenum steel. The fuel department is in charge of H. Kreisinger; and R. A. Wood controls the equipment and staff in the technical division, where complete photograph records are made and classified dealing with every detail of the work in the various departments.

Labor at Broken Hill

MELBOURNE-CORRESPONDENCE

The agreement between the companies and the miners on the Barrier expires in June, and the Amalgamated Miners' Association, the A. M. A., has formulated a number of claims which are given in detail hereafter. In view of the fact that the companies are now dependent on the sale of their products at the world's market price, the agreement with the British government for the purchase of the whole output having expired, it is evident that the association gave little consideration to the present economic conditions.

The general policy of Australian unions in making demands for increased wages and improved labor conditions nowadays is to ask for considerably more than they expect to receive, believing the concessions granted are in proportion to the demands. From that point of view, therefore, the demands must not be taken too seriously, but it is worthy of notice that the unions have expressed opposition to compulsory arbitration in favor of "direct action."

The following are the demands set forth by the association:

Five days of six hours each shall constitute a week's work, with half an hour for crib (lunch period). Overtime shall be classed as time of duty on all Sundays and holidays, and between the hours of 8 and 12 a.m., and after the cessation of the ordinary day or shift. On Saturdays employees shall be paid double time. That the night shift be abolished.

That the wages of all men working along the line of lode be increased to £1 per day. That boys receive the same rate of wages as men. Full pay on the officially recognized holidays, New Year's Day, Good Friday, Easter Monday, Eight Hours' Day, Christmas Day and Boxing Day, all federal, state and municipal general elections day, and on May Day.

That the contract system be abolished on the surface. That five days of six hours per shift from bank to bank shall constitute a week's work for all employees.

Work shall be prohibited in all working places in the mines of Broken Hill where the temperature is 76 deg. F. or over (wet bulb), and if in the opinion of the company the work is absolutely necessary to be carried on, the following hours shall apply in all places where the temperature is 76 deg. F., or over: Four-hour shifts.

That five days shall constitute a week's work for all underground employees, irrespective of the hours to be worked; no work to be done on Saturdays, except as overtime beyond the ordinary working hours, be paid for at the rate of double time.

In the case of an employee meeting with an accident or being required to attend to another who has met with an accident, he shall be deemed to have been on duty during the whole of the shift; and in the case of contractors the company is requested to pay the men wages.

That the contract system for all classes of work along the line of lode be abolished, and the wages system introduced.

That for every machine used for boring purposes two men shall be in attendance, and that three men shall be prohibited from using two machines.

Ambulance men shall be certificated men who have passed the "first-aid" course. One man shall always be in attendance at the ambulance room, and shall be required to do ambulance work only. "First-aid" appliances shall be placed by the companies in all levels where the men are working, at a depot to be agreed upon.

All underground employees shall be paid the same rate of wages, irrespective of their occupation, and a minimum rate shall be the miner's wages, viz., £1 per shift. That all employees shall be paid in the employer's time.

That this rate of wages shall obtain only along the line of lode and within a radius of two miles from the post office; 25% above the line of lode rates to be demanded for all employees working outside the said radius.

That an analysis of the air underground shall be taken in the various mines periodically.

That compensation for occupational complaints be included in the claim on the basis of full wages, the complaints to be specified by the committee collecting evidence for the Board of Trade inquiry.

The probabilities are that the companies will negotiate only through the arbitration court, and that they will demand amendments to the present agreement.

Garnet in North Carolina and the Market For Abrasive Garnet*

BY FRANK J. KATZ†

Although abrasives were relatively inconspicuous war materials, they were nevertheless highly important to the war program and were regarded as "essentials" and as "war minerals." There developed during the war large interest in, and at times in some quarters much concern over, supplies, particularly of emery, corundum, artificial abrasives, and garnet. During the summer and autumn of 1918, the aid of Government agencies was solicited for increasing the garnet supply. In that connection Mr. Katz participated in an examination of garnet deposits in North Carolina and made a special canvass of producers and consumers of abrasive garnet for the purpose of determining the output-producing capacity and consumption of garnet. Results are described in the following article.

GARNET is a group name for certain orthosilicate minerals, alike in crystal structure and homologous in chemical composition, which exhibit a more or less continuous limited range of physical properties correlated with differences in chemical constituents. Their chemical composition is typified by formula $3R''O.R_2'''O_3.3SiO_2$, in which R'' = Ca, Mg, Fe'' Mn; R''' = Fe''', Al, Cr. The common types are grossularite, the lime-alumina garnet; pyrope, the magnesia-alumina garnet; almandite, the iron (ferrous) = alumina garnet; and andradite, the lime-iron (ferric). Many others have been named, but garnets rarely conform to the simple types, and the names cover intermediate varieties which may be regarded as mixtures of type varieties and which differ from one another slightly in chemical composition, color, and other properties. One of these special varieties, which has been named and is important to the present discussion, is rhodolite, a garnet of rose-pink color and intermediate between pyrope and almandite.

All ordinary garnets have in common the following properties, which affect their industrial usefulness: They are harder than quartz and approximately as hard as topaz (about 8 in the common scale of mineral hardness, in which quartz is 7, corundum, ruby, or sapphire is 9, and diamond 10); they are without natural cleavage—that is, they have not the inherent capacity exhibited by many minerals to break readily on parallel planes—but are strong and break with conchoidal or splintery fracture into pieces which have very sharp edges and points; and all are easily fusible. Garnets occur in many colors, but the ordinary varieties range from light browns and reds through darker shades to black. Those of exceptionally rich color and transparency are prized as gems.

Aside from a limited use as gems and as "jewel" bearings in cheaper watches, garnets are used only as abrasive material. In such use garnet is applicable chiefly to work on wood and leather, and to much less extent to that on brass and other metals, and on glass. Most of the abrasive garnet is used in the form of evenly sized grains glued to paper, so-called garnet sandpaper. Some is also used on cloth, and in loose powders and flours. Garnet may also be made up into wheels, blocks, files, or variously shaped grinding and polishing tools such as are made of emery, although this use is uncommon, with, however, the serious limitation that it cannot be made up with so-called vitrified or ceramic bonds, because garnet is fusible at low temperatures.

GARNET DEPOSITS IN NORTH CAROLINA

In North Carolina, as elsewhere in regions of crystalline rocks, garnet-bearing rocks are extensively developed and widely distributed. Garnet is, in fact, a common mineral, and occurs in many varieties of rocks and in sands and gravels. However, not all kinds of garnet are suitable for use, nor will all garnet-bearing rocks serve as sources of garnet. The garnet must be sufficiently abundant and in crystals large enough to make its extraction from rock profitable. Successful exploitation of garnet deposits depends, also, on those features of situation which affect ease and cost of quarrying and milling and accessibility to market. In Clay, Jackson and Madison counties, North Carolina, certain occurrences of garnet have long been regarded as favorable for the development of abrasive-garnet production and have at times yielded a small output.

CLAY COUNTY

The garnet deposits in Clay County which have attracted interest are on Shooting Creek, near the post office of the same name, and at the head of Buck Creek, on Penland Bald Mountain. These deposits are 20 to 30 miles by wagon road from the nearest shipping points, Murphy or Marble stations on the Southern Railway.

The garnet deposits on and near Penland Bald are on the crest of a sharp ridge that stands 4700 to 4900 ft. above sea level and on the steep slopes immediately below this ridge facing westward, toward the valley of Buck Creek. The country rock there, which in itself constitutes the garnet formation, is a medium to coarse-grained layered hornblende gneiss, a part of that described by Arthur Keith in the Nantahala Folio of the "Geologic Atlas of the United States," under the name of "Roan gneiss." At Penland Bald this formation is made up of several layers ranging in composition from almost pure hornblende rock to a hornblende feldspar rock approximately dioritic in composition. Some of the layers contain garnet, which is an ordinary bright red almandite. The garnet-bearing rock is exposed on the summit of Penland Bald and farther north for about 300 ft. along the crest. North of this stretch of 300 ft. there is an interval of approximately equal length of hornblende rock which is not garnet bearing; and north of that again, along the ridge, through about 2000 ft., there is a succession of garnet-bearing and

*Published by permission of the Director, U. S. Geological Survey.

†Geologist, U. S. Geological Survey, and specialist on abrasive materials.

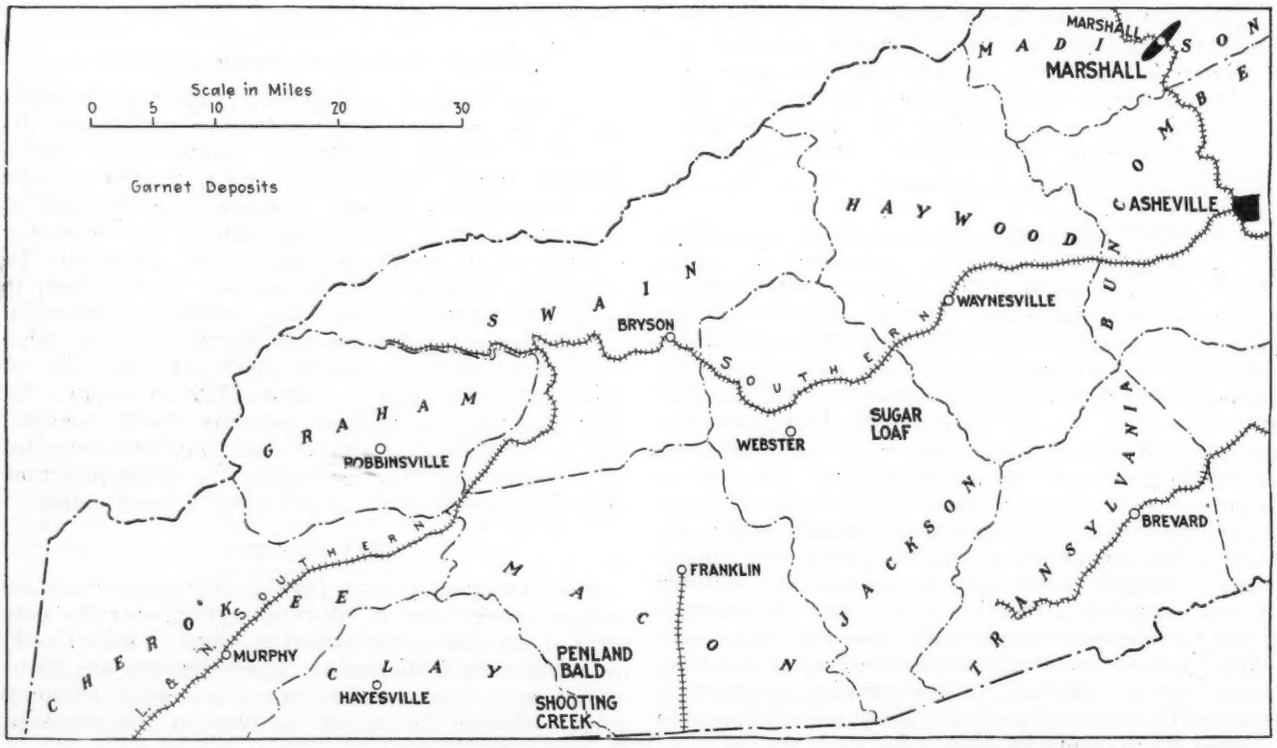
garnet-free hornblende gneisses, but most of the rocks in this stretch are garnet bearing.

Along the crest of the ridge the gneisses have a general northeast strike, varying from north-northeast to east-northeast. The several departures from this general trend are due to minor undulations in the layering of the gneiss and to at least one short dislocation along a fracture plane. The rocks dip westward toward Buck Creek at various angles, but in general at about 45°. On the west side of Penland Bald ridge through a vertical distance of 600 ft., on steep slopes, in places 30° or more, the rocks exposed in several cliffs and bare ledges are garnet bearing. Below these slopes, through a further vertical height of 200 ft. in and on the sides of ravines, are many other small exposures. Below these, through a further descent of 100 ft., a heavy cover of coarse, angular talus composed of garnet-bearing rock mantles the slope. Beyond and below a point about 3900 ft. in elevation and seven-eights of a mile east of main Buck Creek, garnet-bearing ledges and talus are not seen. The zone occupied by the garnetiferous gneiss crosses Penland Bald diagonally from northeast to southwest and extends undetermined distances in both these directions. In the area examined there is a length of exposure of garnetiferous gneiss of about 1700 ft. along the strike, about 1200 ft. horizontally and 800 ft. vertically, in a direction inclined to the strike and down the slope.

The garnet in the rocks on Penland Bald is in rudely dodecahedral, approximately spherical crystals, the largest 2½ in. in diameter. Some of the crystals are very small, and those most commonly seen in the outcrops are between ⅛ in. and 1½ in. in diameter. They are irregularly and unevenly distributed through the rock, being sparse in some places and rather numerous in others, and are visibly segregated in certain layers or zones in the hornblende gneiss, but these layers, within the parts which may be generally designated garnet bearing, are not widely spaced, so that the entire bulk of rock underlying the area outlined may be considered workable. The apparent garnet content ranges from 2 or 3 to 5% and, locally, upward to 12 or possibly 15% by volume, and here and there over small patches it may aggregate 25%. I took four samples by crushing and mechanical separation. These samples do not represent the average garnet content of the Penland Bald exposures, but are merely typical of specific occurrences, and they were taken to determine the reasonable expectation of garnet recovery from certain better parts of the rocks examined. This was found to be probably 10% (by weight) on the average. By selection of the more richly garnetiferous rock, a much higher yield of garnet might be obtained.

In the evidently large area of garnet-bearing rock within which quarries might be developed, a tract including Penland Bald summit and the slopes immediately below it was estimated to contain 5,000,000 long tons of garnet-bearing rock, or 500,000 long tons of garnet, at least half of which, or 250,000 long tons, is recoverable. This is more garnet than will be needed, at the present rate of consumption, to supply the United States for 30 years. In the above calculation no account is taken of other blocks of ground possibly not so large as the one considered but otherwise equally favorable, and in addition there are large volumes of "float" rock in the talus on the lower slopes immediately below the tract estimated, and this "float" is also favorably situated and in good condition for quarrying and milling.

Only cursory examination was made of the red garnet deposits on Shooting Creek near the mouth of Thumping Creek, about a mile from Shooting Creek post office. These deposits lie in a zone of hornblende gneiss which extends from north of Thumping Creek south-southwestward across the forks of Eagle Fork, and, as mapped in the Nantahala Folio, are part of the band of Roan gneiss of Penland Bald already described. The



SOUTHWEST NORTH CAROLINA, SHOWING LOCATION OF GARNET DEPOSITS

rocks and the garnet content are like those on Penland Bald. They visibly occupy a large area, and their quantity is unquestionably adequate to invite quarrying. There are several convenient quarry and mill sites on these deposits.

In the vicinity of Shooting Creek there are also deposits of so-called black garnet, which are said to be large and to yield readily an abrasive garnet of excellent grade. These deposits were not examined and the garnets themselves have been only casually examined. They appear to be almandites, normally red garnet, but are so filled with small inclusions of black or dark minerals that the garnets appear black except in very thin splinters. The inclusions are minute and are completely incorporated in the body of the garnet crystals, and they apparently in no way interfere with the abrasive quality of the garnets; indeed it has been stated, although not confirmed, that these black garnets approach emery in abrasive efficiency.

Jackson County

The Sugar Loaf Mountain garnet deposit is 2½ miles south of Willetts Station, in Jackson County. It is connected with Willetts by a rough mountain road. The geologic conditions affecting the Sugar Loaf garnet project are simple. The country is occupied by various gneisses and schists of the Carolina gneiss formation, which strike northeast to east-northeast and stand nearly vertical. Of these, a zone or group of layers from 200 to 600 ft. thick, possibly thicker—precise measurement being impossible because of lack of suitable exposure—is composed of mica schists and mica-quartz-feldspar schists containing pink garnet of the rhodolite variety. Within this zone there is considerable variation of rock from band to band. The bands, however, are all thin, ranging from a fraction of an inch to a few feet in thickness, and the greater part of them are garnetiferous. Some of the bands contain only rhodolite and mica, the rhodolite being predominant in quantity, and some are composed of rhodolite, quartz, and mica, the rhodolite again predominating.

In all of the three larger openings made on this mountain the garnet content of the rocks, taking as a whole all rock layers exposed, will not run lower than 25%. The largest garnets in these bands are ½ to ¾ in. in diameter. Most of them are between ⅛ and ¼ in. in diameter, and in some bands they are so thickly studded that they constitute more than 60% of the rock and are separated only by small amounts of mica or mica, quartz, and feldspar. These rocks extend from the stream just south of the Great Ruby Mines Garnet Mill, at the base of Sugar Loaf Mountain, continuously to the summit of Sugar Loaf, a vertical distance of 1000 ft. The rocks are less well exposed on the opposite side of the mountain, but are doubtless continuous from the summit to the creek at the southwest base of Sugar Loaf Mountain. In a triangular block of garnet-bearing rock 1000 ft. in height, 3000 ft. on the base (that is the distance across the mountain or along the strike through which the rocks were traced) and 200 ft. thick, there is 300,000,000 cu.ft. of garnet-bearing rock, all of which contains at least 25% of garnet of the rhodolite variety. Assuming 12 cu.ft. to the long ton, there are 6,000,000 long tons of garnet. Further, according to geologists Arthur Keith and Douglas Sterrett,[1] who have mapped the region, this garnet belt is virtually continuous through Double Top Mountain, a peak standing 1000 ft. higher than Sugar Loaf, and extends 1¼ miles eastward along the strike. Therefore the supply of garnet at this locality is for all practical purposes inexhaustible.

[1]Oral communications to the writer.

Madison County

Garnet is found in large amounts west and northwest of Marshall, in Madison County. This region has produced some garnet, and it may again be productive. The deposits there were under investigation in 1918. The garnet-bearing rock is a fine to moderate grained gray mica schist, which is mapped in the Asheville Folio[2] as a part of the Carolina gneiss. This rock contains numerous garnet crystals, which in places make up one-fourth to one-half of the rock. Most of the crystals are ¼ to 1 in. in diameter; the largest measure 2 in. They are for the most part well-shaped dodecahedrons and where not altered by weathering are bright red. The richly garnetiferous layers, like the inclosing schists, dip southeastward and strike east to north. One of these layers or so-called veins is 8 to 10 ft. thick and has been developed as garnet bearing for a quarter of a mile. These garnets are of the almandite variety and make an excellent abrasive. The rock is rich enough in garnet for economical treatment, and the situation close to the railroad along French Broad River is favorable for profitable exploitation.

Market Outlook

The market outlook for abrasive garnet may be forecast by balancing against present and probable supply of garnet the present and immediate future consumption or demand for garnet. The garnet supply of the United States has been derived from domestic production, and during recent years also from imports from Spain. The domestic production has been made chiefly by concerns operating quarries in the Adirondack region, New York, but there have been considerable contributions also from Merrimack County, N. H., and from Clay and Jackson counties, N. C. The latter, however, have been varying in amount and intermittent, ranging from 10 to 20% of the total. The table shows the sales made annually by the producing companies for the years 1911 to 1918, inclusive.

TABLE I. SALES OF GARNET BY PRODUCING COMPANIES

Year	Quantity, Short Tons	Value	Year	Quantity, Short Tons	Value
1911	4,076	$121,748	1915	4,301	$139,584
1912	4,947	163,237	1916	6,171	208,850
1913	5,308	183,422	1917	4,995	198,327
1914	4,231	145,510	1918	4,600	242,400

The total annual output has ranged from 4231 to 6171 short tons. The entire garnet-producing capacity of all the concerns has not been drawn on during any recent years, and, as far as I am able to determine, has been approximately 6500 short tons a year.

Part of the garnet supplied to the domestic industry has come, as stated, from Spain. This imported material has been in the form of small rolled grains of garnet recovered by washing stream gravels in the Province of Almeria. Complete and accurate records of the imports of garnet are lacking. Official Spanish reports of mineral production, together with fragmentary records of imports into the United States, indicate that in 1916 approximately 1800 tons, and in 1917, possibly 2000 tons, were imported. It is probable that the imports have never exceeded 2500 tons a year, and the total new supply in the United States in any one year, from both

[2]Keith, Arthur, "U. S. Geol. Survey Geol. Atlas," Asheville Folio, No. 116.

domestic production and imports, has not been over 8500 tons. The year of largest supply was 1916.

The actual consumption of garnet in the United States in making garnet paper and cloth in 1918, as determined by a thorough canvas of the manufacturers, was 6000 short tons, and it will be about the same in 1919. Data on the quantity of garnet used loose or made up into abrasive tools or materials, other than paper and cloth, are not accurate, but the best information available leads to the belief that the amount so used is less than 500 tons.

The present domestic consumption of abrasive garnet is about 6500 short tons a year, but this is hardly a fair measure of the capacity of the market to absorb the garnet, as an indeterminate amount will be taken by manufacturers and consumers who wish to acquire reserve stocks. At present there is apparently little stock in reserve, both because of the cutting off of Spanish imports owing to shortage of ships and difficulties in shipping during the war, and because war conditions have enforced operation at reduced capacity by domestic producers for the last two years.

One other consideration which would suggest a growing or increased market for garnet is the probable discovery or invention of new uses for abrasive garnet. It has been suggested that garnet may be used as a substitute for emery in working plate glass. Reports of glass grinders on experiments already made differ as to the desirability of using garnet for this purpose, but at least one manufacturer believes that plate glass can be successfully beveled with good garnet. If such practice is established, there may be an additional demand for as much as 1000 tons of garnet yearly. It has also been suggested that crushed garnet grains, instead of crushed quartz or silica sand, may be used for sand blasting in cleaning castings and like work. Tests are reported to have proved that garnet is far superior to the materials ordinarily used for this purpose. If such use of garnet is generally adopted, the amount required will be large; it may possibly far exceed the total garnet used for all other purposes. The third new or increased use may be found by perfecting the methods of bonding garnet grains in wheels, blocks, files, and other shapes.

There does not appear to be much market for garnet outside of the United States. Attempts to market garnet grains in Europe have been unsuccessful, but there has been a little sale there for garnet paper and cloth as a substitute for sandpaper, and upon the return of industry to normal conditions more American garnet will probably be marketed abroad. The use of garnet as an abrasive appears to be largely restricted to America, but it may be developed in foreign countries by proper introduction and advertising.

Conclusion

As a result of lack of imports and of reduced domestic output during the last year, the supply of abrasive garnet is short to the extent that reserve stocks are small or are exhausted. The demand is strong and prices are high. During the later part of 1918 the price per net ton of cleaned crushed garnet was nearly twice the pre-war normal price of $30 to $35. The developed productive capacity of the country is, however, approximately equal to the normal demand, so that the demand and prices will probably fall off with return to normal conditions.

Without the development of new uses of garnet the outlook is good for garnet-producing concerns that are fairly well established both as to plant and as to acquaintance and experience in the market. There would appear to be no attractive opportunity for the establishment of new producers or for the exploitation of deposits now undeveloped. If, however, new uses are found, or if appreciably larger quantities of garnet will be needed for present purposes, there will be some need for an increase of garnet production in the United States, possibly by the opening of deposits now unproductive.

Mining in Costa Rica

The only minerals mined in Costa Rica are gold and manganese, states a consular report. The Costa Rica Manganese and Mining Co. is the only concern that has so far exported manganese in quantity. Manganese mines have been opened by Dr. Guistiniani at San Pablo, by José Ma. Castro at Tambor, and by Rafael Yglesias at Puerto Viejo. But these have so far been insignificant producers. The Nicoya Mining Co., of Playa Real, has exported manganese in small quantities. The gold output shows a tendency to decrease, owing to the increased cost of working. Practically all capital invested in Costa Rica mines is American. It is not unlikely that the fall in the price of manganese will make its mining in Costa Rica unprofitable, owing to the high export duties and to the restrictions that have been placed upon the mines.

Arizona Mineral Locations

By A. L. H. Street *

According to law, a mineral location that is to be valid for any purpose must be made upon unappropriated Government land, open to location, in which mineral has actually been discovered in place. Until such discovery, all acts tending to consummate a valid mineral location give the locator no right other than to continue reasonable search for mineral.

The period allowed by the Arizona statutes within which the location is required to be completed is limited to 90 days after the discovery of mineral on the ground, in any event, and the addition of such further time as may pass before conflicting rights intervene. The unquestionable right of the locator to the possession of the area within the boundaries of the claim marked on the ground by the requisite monuments, as described in the location notice posted at the location monument, carries the privilege of possession of every appurtenant belonging to the realty, including timber, soil, country rock, percolating waters, and natural springs, with the exception of certain mineral springs.

These principles of mining law were laid down recently by the Arizona Supreme Court in the case of McKenzie vs. Moore (*176 Pacific Reporter 568*), a suit involving rights as between conflicting locations.

A Potash Concession has been given to Raphael A. del Valle by the Mexican government for the extraction of potash from seaweed on the coast of Lower California. Senor del Valle is desirous of interesting American capital in a plan to build a plant for the extraction of potash; and states that the undertaking can be made profitable. The Foreign Trade Bureau has been requested to give publicity to this statement. Interested parties should communicate with C. L. Lugue, Mexican Commercial Agent, Wright Arcade Bldg., St. Louis, Missouri.

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Control of Ore-Dressing Operations

By GEORGE J. YOUNG

The success of ore-dressing and milling operations is determined not only by good mill design and construction, but more, perhaps, by the proper control of operations. The writer of the accompanying article discusses points to which the mill superintendent should direct attention and which contribute to the success of the plant.

A MILLING plant receives daily a more or less continuous stream of material, which is divided by the appliances into two parts, one of which is essentially waste or tailings and the other a marketable product. Both parts contain valuable minerals, but the tailings contain the lesser proportion of the original weight of valuable mineral in the stream of ore. Control signifies the technical supervision of the separation in such a way that all of the valuable material that it is possible to save appears in the marketable product. In addition, the term includes the technical supervision of the costs of operation, to the end that milling operations be effected at minimum expense.

A third feature and an important one is that the marketable product be of such a nature that it can be readily sold, and that the cost of marketing be reduced to a minimum. A steady supply of ore of uniform grade is the first essential imposed by the requirements of effective operation. This can be accomplished by the judicious selection, both as to quantity and kind, of ore drawn from different parts of the mine. It is good mining practice to have a number of stopes open, and, by careful sampling and estimation of quantities, to mine from each stope at such a rate as to produce the necessary uniformity in the ore stream. It is also good practice to maintain a surplus of broken ore as a reserve. Large mill bins are desirable, as they serve to tide over temporary interruptions in the ore supply. By careful distribution in the ore bin, the different grades of ore can be mixed sufficiently to comply with the requirement of uniformity in grade.

The weight of ore delivered to the mill and the taking of a representative sample for assay and analysis are essential for the accurate determination of the metal input. The mill superintendent must also make a thorough study of the physical and mineralogical characteristics of the ore of average grade and the variations that might be expected to occur in the continuous operation of mine and milling plant.

The outflow from the plant must be quantitively estimated. This requires that the stream of waste be carefully sampled and the mineral contained therein determined. The shipping product is also weighed and sampled. The input, less the weight of the shipping product, will give the weight of the tailing. Input values and waste values, together with the value of the shipping product, are quantities which make possible an accurate check on the work of the mill as a whole. The money outgo in a unit of time, a month for instance, is the check in expense for the plant as a whole.

What has just been described constitutes the overall control of the work, and, were this all, there would be little to the problem. The work of different plants will differ in detail, but the procedure of control of the detail work is similar in principle in all plants. If it is assumed that the major operations are crushing, sizing and classification, coarse concentration and fine concentration, the control work can be specifically described.

The layout of the crushing division is assumed to be such that there is no unnecessary handling of material and no unnecessary crushing. If crushing is in stages, the crushing machines of each stage should be considered as one unit, and the control work laid out for each separate unit. The input to each machine should be determined either from weights, or by the deflection of the stream for a given time interval. Samples of the input and output streams should be taken, and a screen analysis made on each sample.

Oversize returns should be given special attention. The result of these determinations indicates whether each crushing machine is in proper adjustment and is doing the work that it is supposed to do. The frequency of such an examination is determined largely by the conditions of each case. In my opinion, once a month would be sufficient. At the time of the examination each motor should be carefully metered, and, if more than the normal amount of power is being consumed, a careful examination of the shafting and machines should be made, and necessary readjustments and repairs promptly carried out. Inspection of bearings and machines should be made at frequent intervals, as, by so doing, the repair work can be greatly diminished and costly breakages avoided. Oilers should be required to inspect each bearing at least twice a shift.

Sizing and classification require systematic sampling and screen analysis of products at major intervals of a month, and inspection at least twice a shift. As in the case of crushing machines, the mechanical condition requires close attention. Where separate motor drives are used, each motor should be metered once a month. Journal inspection twice a shift is also necessary. Oversize returns require special attention, and where such returns are reduced to a minimum, on account of the enlargement of screens due to excessive wear, prompt replacement of screens should be made. Similarly, excessive amounts of return should be prevented by the careful readjustment of rolls, breakers, or other crushing appliances.

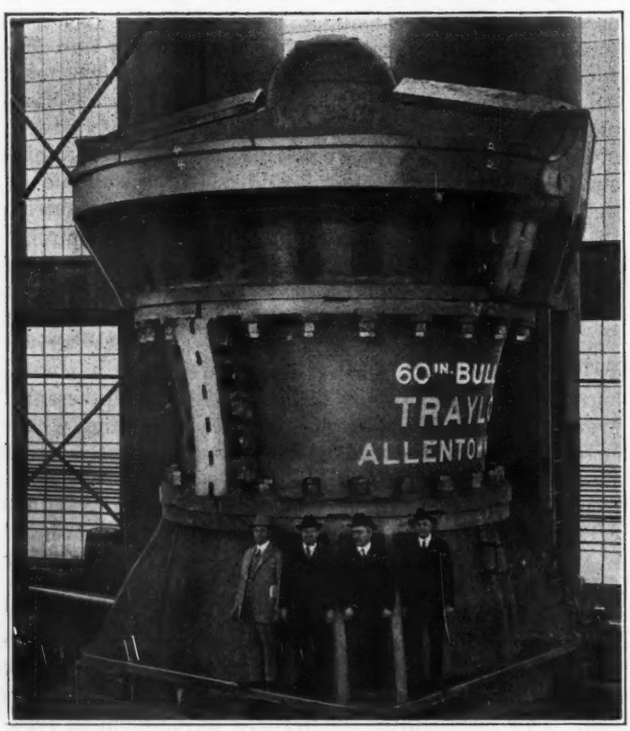
Tonnage control of crushing appliances is important in reducing the power requirement of each machine to a minimum. Each machine should receive a flow well up to its maximum capacity without incurring an overload. This necessitates the periodic adjustment of feeding appliances and the making of flow determination. Screening and classifying appliances are dependent for efficient work upon the careful control of the quantity of material fed to them. Maximum capacity is not as important as for crushing machines, and overload greatly diminishes efficiency. The screening and classifying capacity should be in excess of requirements, and, where flow determinations show overloading, additional equipment should be added.

Each group of coarse-concentration appliances should be treated as a unit and the products systematically sampled and examined. Flow determinations should be made, and from them the pulp dilution and clear-water

requirements measured. When the saving of water is necessitated by reason of scarcity or cost, the study of the adjustments of the machines should be thorough. It is evident that initial operation requires frequent sampling and testing of the products until the adjustment of each machine has been properly made. With coarse-concentration machines, dip samples can be taken and examined under a magnifying glass, and in most cases sufficient information will be obtained for making adjustments. The work of a unit should, however, be quantitively ascertained by flow determinations and samples. Input and output quantities, together with inflowing and outflowing metallic values, are necessary before the work of the unit can be determined. As in the case of the crushing units, a quantitive estimate is not required at short intervals. Power determinations are also made, and the same careful examination of the mechanical condition is necessary. A similar procedure is carried out for the fine-concentration appliances.

New 60-In. Gyratory Crusher

What is claimed to be the world's largest gyratory crusher has recently been manufactured by the Traylor Engineering and Manufacturing Co., of Allentown, Penn. The dimensions of the crusher's principal parts are: Height (foundation to top of hopper), 17 ft. 8 in.; diameter (hopper), 19 ft. 6 in.; length of shaft, 21



TRAYLOR 800,000-LB. CRUSHER

ft.; diameter of shaft, 40 in.; size of receiving openings, 60 x 190 in.; diameter of driving pulley (rope sheave), 7 ft.; eccentricity, 2 inches. The weights of the principal parts are: Shaft, 56,000 lb.; shaft (assembled), 62 tons; head, 60,000 lb.; top shell (two pieces), 108,000 lb.; middle shell, 100,000 lb.; bottom shell (a single casting), 95,000 lb.; bottom shell (with lining), over 105,000 lb.; spider, 60,000 lb.; crusher complete, about 800,000 pounds.

The capacity of the crusher will be from 2500 to 3000 tons per hour, crushing to a 8- to 9-in. product. When running under full load the crusher will require about 350 hp. Running light it will consume 75 hp. Lubrication will be by forced feed, by which a continuous oil circulation will be maintained through the eccentric. The oil will be circulated by a pump situated in the bottom of the crusher, and the system will contain about 9 bbl. of oil.

The gears are of cut steel, the spider is of the Hewes type, and a special construction protects the shaft bearings and eccentric from dust. Among the special features of the machine are the self-aligning eccentric and the fact that the shaft is rigid and compact and that the machine can be readily stripped for repair. It will be used to handle the product of steam shovels at a limestone quarry. The material will be dumped into the receiving hopper from 12½-ton cars, eight of which make up a train. The crushed limestone will deliver to a 48-in. belt conveyor, running at 500 ft. per minute.

The crusher was built in 3½ months, and the parts were assembled for shop test in three days. The design and development of the machine have been largely in the hands of Richard Bernhard and L. J. Hewes, chief engineer and Chicago district manager, respectively, for the Traylor Engineering and Manufacturing Co. The company is planning to build a still larger machine as soon as steam-shovel operations at the quarries are developed to handle the greatly increased tonnages required.

South Dakota 1918 Mineral Production

According to the annual report of the State Mining Inspector, the production of gold and silver in South Dakota for 1918 showed a decrease of $814,860 over the previous year's output. The total for the year was as follows:

SOUTH DAKOTA MINERAL PRODUCTION FOR 1918

Source	Tonnage Treated	Yield
Homestake	1,628,630	$5,923,652.91
Trojan	107,373	530,642.33
Mogul-Ofer	33,750	169,974.82
Golden Reward	6,542	36,588.76
Bismarck	5,120	18,864.76
Miscellaneous	235	5,300.00
Placer	.....	1,400.00
Totals	1,781,650	$6,686,423.75

The Homestake company shipped tungsten ores and concentrate valued at $281,474.57. The Bismarck company received $2282.18 for ores of this class; and lessees and smaller producers received $3550, making a total for the tungsten production of $287,306.75.

Mica was shipped to the amount of 249 tons, valued at $10,464.01. Lithia ores recovered amounted to 1500 tons, with a value of $82,500. Copper ores to the extent of 641 tons, and having a value of $9156.81, were sent to the smeltery; most of these ores were taken from the property of the Maloney Blue Lead Copper Co., near Keystone.

Lead-silver ores and concentrates shipped aggregated 159 tons, having a value of $6521.39; and 916 tons of pyrites, having a value of $7200, was sent to market, all of which was taken from the Olaf Seim mine, near Deadwood. Gypsum and gypsite recovered had a value of $45,160; coal, $39,237; kaolinite, $8000; beryl, $270; columbite, $280, and limestone and structural materials, $180,000; making a grand total for all mineral production of $7,362,519.71.

The average number of persons employed in the mineral industry was 2049, excluding coal mines and quarries. There were no fatal mine accidents.

Condition of Bordeaux Market For Sulphur

In *Commerce Reports* for May 5, 1919, Vice-Consul V. W. O'Hara, of Bordeaux, France, says that investigation into the local market discloses that there is at present no market for sulphur products, and, in fact, the same condition appears to hold for all of France in any large commercial way. This is due to the fact that the French government controls the buying and distribution of these products.

In commerce, sulphur products are used in this section mostly in connection with the vine-growing and wine-production business. In regard to copper sulphate, the government has purchased a large quantity at a high figure, nearly enough for next season's needs for all of France, and, it appears, will not let down the bars for importation until it disposes of its contracted stock.

Sulphur is, and will continue to be until July 31, 1919, under government control. Purchase and distribution are made through L'Office Central des Produits Chimiques Agricoles, 42bis Rue de Bourgogne, Paris (VIIe). Sale of either lump or refined sulphur, or of both, might be made to this organization for immediate delivery, and only after government control is relinquished will general commercial interests attempt to import this article, as a small order would not be worth while and a large quantity would undoubtedly be requisitioned. Orders could, however, be taken now for future delivery if the question of prices were readily arranged. The needs of the Department of the Gironde are about 8000 tons annually.

Lump sulphur was quoted on the local market at the end of February at 40 fr. per 100 k. (220 lb.) bulk, minimum 3000 tons (no import tariff). The product, however, is used in the refined state and was quoted on the local market at 60 fr. per 100 k., c.i.f. Bordeaux, in double sacks, minimum 2000 tons (import tariff, 3 fr. per 100 k.). The only refinery in this region is the Compagnie Europeene de Traitements des Minerais, Quai de Brazza, Bordeaux, a branch of a San Francisco firm, but it is now under requisition by the French government. There are several sulphur refineries at Marseille and Cette.

Relatively, a large amount of sulphur was imported from the United States before the war, the American product being as good as and obtainable at a better price than that imported from Italy.

Cadmium in the War

A report on cadmium in 1918, prepared by C. E. Siebenthal, of the U. S. Geological Survey, describes the minor but interesting uses of this metal in the war. The war interest in cadmium centered mainly in its employment as a substitute for tin, and its use in bronze telegraph and telephone wires.

The large quantity of tin used in making food containers for rationing the American and Allied armies, combined with the lack of shipping and the loss of several cargoes of tin, produced a critical scarcity of tin in this country and led to Government control of its distribution, as well as to a campaign for its conservation. One method of saving tin is to substitute cadmium for it in solder. In the last year of the war the Government and certain large concerns began experiments with cadmium solders as a means of saving tin. The results of these experiments were promising, but the demand for tin decreased, and the armistice was signed before cadmium solders became widely used.

Cadmium was used by European nations during the war for some strictly military purposes, but little exact information is available to show those purposes.

The first of the belligerent nations to make large use of cadmium as a substitute for tin in solders was Germany, which from the beginning of the war was cut off by the blockade almost entirely from the world's sources of tin. The great scarcity of tin in Germany is indicated by the fact that over 30% of the cargo of the submarine "Deutschland," on her return trip in July, 1916, consisted of pig tin. Solders containing 10% of cadmium were used in Germany early in the war, and some were reported to contain as high as 30% of cadmium and only 2% of tin, instead of the customary 40 or 50%. Nickel was also scarce in Germany; it made up a large part of both the cargoes carried by the "Deutschland"; and in Germany cadmium-plating may have been substituted for nickel-plating where possible.

About 600 tons of cadmium accumulates annually in this country as dusts and residues, byproducts of the lead and zinc industries, and from these byproducts about 100 tons of metallic cadmium is recovered. If all the cadmium dusts and residues were treated, the output of metallic cadmium would be small in comparison to the 19,000 or 20,000 tons of tin annually used in this country in solder, even if due allowance is made for the fact that 1 lb. of cadmium can replace from 3 to 5 lb. of tin.

The output of metallic cadmium in the United States in 1918 was 127,164 lb., as compared with 207,408 lb. in 1917, and the output of cadmium sulphide in 1918 was 51,702 lb., as against 50,169 lb. in 1917. The average value per lb. for metal and for sulphide was $1.48 and $1.36 in 1918, as against $1.47 and $1.41 in 1917. The exports of cadmium in 1918 were 62,320 lb., of which 30,440 lb. was sent to France and 20,000 lb. to Japan.

The market for metallic cadmium was not strong in the first half of 1918, and considerable stocks accumulated. Production was somewhat curtailed before August and almost stopped for the remainder of the year.

Petroleum in March and February

A comparative summary of the quantity of crude petroleum produced and marketed, imported, consumed, exported, and held in storage in the United States in February and March, 1919, and in March, 1918, prepared by C. C. Osbon and E. Russell Lloyd, of the U. S. Geological Survey, is given herewith. The statements with respect to fields east of the Rocky Mountains are based upon reports filed by about 200 pipe-line, marketing, and refining companies, only such refineries being included as receive crude oil by private pipe lines or tank cars directly from the wells. Statistics relating to California and to imports and exports were compiled from secondary sources. This statement indicates the general trend of conditions in the crude-petroleum industry of this country. The data are subject to revision in subsequent statistical reports.

The quantity of crude petroleum run from wells and producers' field storage tanks, and delivered to pipe lines, marketing companies, refineries, and other consumers in the United States in March, 1919, amounted to

approximately 30,412,000 bbl., an increase of 3,901,000 bbl., or about 13%, compared with February, 1919, and of 873,000 bbl., or nearly 3%, compared with March, 1918. The average daily rate in March, 1919, was 981,032 bbl., a quantity greater by 34,210 bbl., or a little more than 3%, than the average daily rate in the preceding month, and by 28,162 bbl., or nearly 3%, than the average daily rate in the corresponding month of last year. It is noteworthy that the general trend of production in March, 1919, compared with March, 1918, was upward in all the oil fields except Lima-Indiana, where there was a slight decline in average daily rate of production. Credit for the greatest increase is due to the Gulf Coast field, which added about 16% to its daily average. The corresponding increase in California was about 6%, and the Illinois field, which has been declining in production for several years, increased its daily output to the extent of nearly 11%, compared with February, 1919. Declining production in some of the Oklahoma pools was a little more than offset by the flush production in the northern Texas and Louisiana areas of the Mid-Continent field.

Approximately 98% of the oil included in the following table was actually brought to the surface in the United States in the months specified, the remaining 2% consisting of runs or tank-car shipments from field storage. Data concerning the quantity of oil run into field storage are not available.

TABLE I. MARKETED PRODUCTION OF DOMESTIC CRUDE PETROLEUM
(Barrels of 42 Gal. Each)

Field	March, 1919	February, 1919	March, 1918
Appalachian	2,453,000	2,185,000	2,178,000
Lima-Indiana	282,000	274,000	291,000
Illinois	1,166,000	940,000	1,190,000
Mid-Continent	14,629,000	13,211,000	14,697,000
Gulf Coast	1,890,000	1,441,000	1,826,000
Rocky Mountain	1,168,000	990,000	1,048,000
California	8,824,000	7,470,000	8,309,000
Totals	30,412,000	26,511,000	29,539,000

Petroleum Consumption

It is estimated that 28,212,000 bbl. of domestic crude petroleum was delivered in March, 1919, to refineries and other consumers of crude oil and used for the manufacture of petroleum products and for fuel, or exported. This quantity is greater by 1,053,000 bbl., or about 4%, than the quantity so delivered or consumed in February, 1919, but less by 3,341,000 bbl., or 12%, than the consumption in March, 1918. However, the average daily rate of consumption was 910,065 bbl., a decrease of 59,901 bbl., or nearly 7%, compared with the daily rate in February, 1919, and of 107,774 bbl., or about 12%, compared with the rate in March, 1918.

The following table, computed from marketed production and stocks, includes approximately 99% of the total quantity of domestic crude oil consumed or exported in the months referred to, the remainder representing oil used by producers in drilling and pumping.

TABLE II. CONSUMPTION OF DOMESTIC CRUDE PETROLEUM
(Barrels of 42 Gal. Each)

Source of Oil	March, 1919	February, 1919	March, 1918
Appalachian	2,359,000	1,993,000	2,110,000
Lima-Indiana	251,000	226,000	312,000
Illinois	580,000	418,000	1,232,000
Mid-Continent	13,553,000	15,356,000	16,070,000
Gulf Coast	1,251,000	1,103,000	2,190,000
Rocky Mountain	1,209,000	964,000	920,000
California	9,009,000	7,099,000	8,719,000
Totals	28,212,000	27,159,000	31,553,000

Although the United States leads the other countries of the world in the production of crude petroleum, the quantity obtained from domestic sources is inadequate to meet the demand, and a large volume is imported, chiefly from Mexico. Table III shows that the imports of crude petroleum in March, 1919, were materially greater than those of the corresponding month last year.

Although the export trade of the petroleum industry in the United States consists chiefly of refined products, a substantial volume of crude oil is being exported for the manufacture of petroleum products in Canada, Cuba, and other foreign countries, as shown by Table III.

TABLE III. IMPORTS AND EXPORTS OF CRUDE PETROLEUM (a)
(Barrels of 42 Gal. Each)

	January, 1919	February, 1919	March, 1919	March, 1918
Imports				
Source				
Mexico	3,899,376	3,655,542	3,492,800	2,557,141
Other countries	25	84	981	2
Totals	3,899,401	3,655,626	3,493,781	2,557,143
Exports				
Destination				
Canada	270,554	131,622	178,228	169,045
Colombia	.....	5,952	.....	4,762
Cuba	39,886	.....	39,394	35,007
Mexico	1,018	53	628	357
Other countries	27,561	45,876	144	47
Totals	339,019	183,503	218,394	209,218
Excess of imports over exports	3,560,382	3,472,123	3,275,387	2,347,925

(a) Compiled from the records of the Bureau of Foreign and Domestic Commerce.

Data are not available concerning the quantity of Mexican crude oil held in storage in the United States. If, however, the consumption of Mexican oil keeps pace with importation, Table IV indicates the total quantity of petroleum exported and delivered to refineries and other consumers in this country.

TABLE IV. TOTAL CONSUMPTION OF DOMESTIC AND IMPORTED CRUDE PETROLEUM
(Barrels of 42 Gal. Each)

	March, 1919		February, 1919		March, 1918	
Kind	Total	Daily Average	Total	Daily Average	Total	Daily Average
Domestic	28,212,000	910,065	27,159,000	969,964	31,553,000	1,017,839
Imported	3,493,781	112,702	3,655,626	130,558	2,557,143	82,488
Totals	31,705,781	1,022,767	30,814,626	1,100,522	34,110,143	1,110,327

Diamonds in the United States*

The importation of diamonds into the United States shows a marked change during the war period. Prior to 1914 about two-thirds of the stones imported were classed as "cut, but not set," whereas only about one-third of the total value was classed as "uncut."

The diamond cutting of the world was carried on prior to the war chiefly in the Netherlands, Belgium and France, and that industry was, of course, entirely suspended in Belgium, in considerable part in France, and also materially affected in the Netherlands. As a consequence, the value of cut diamonds imported into the United States dropped from $27,000,000 in 1913 to $18,000,000 in 1914 and $9,000,000 in 1915. By 1916 the uncut diamonds began plainly to take the place of the cut diamonds in the importations, and in 1918 for the first time showed a greater value in imports than those classed as "cut, but not set." In the eight months ended September, 1918, the imports of uncut diamonds amounted to $10,424,000 and the group "cut, not set," to $6,501,000.

The recent great increase in importations from England occurred almost exclusively in uncut diamonds, which that country had apparently drawn direct from her South African colonies and sent in the uncut form

*Abstracted from *South African Mining Review*, March, 1919, p. 132.

to the United States, which has of late actively developed the diamond-cutting industry.

The value of the diamonds in the United States at the present time is apparently more than $1,000,000,000. As early as 1900 a distinguished American diamond expert estimated that $500,000,000 worth of diamonds were owned in the United States, and a compilation just made by the National City Bank of New York shows that the value of diamonds imported since 1900 is $506,000,000.

This alone would bring the total value of the diamonds of the country above the billion-dollar line, but when it is remembered that $175,000,000 worth of the diamonds imported since 1900 came in the uncut state, and that their value was doubled by the cutting process, which occurred within the country, it is apparent that the value of the stock is considerably more than $1,000,000,000, ignoring the further fact that prices of diamonds have increased materially during the war.

It is considered probable that fully one-half of the world's stock of diamonds is now in the United States.

Production of Corundum and Emery In 1918

The production of corundum and emery in the United States in 1918 was much smaller than in the two previous years, according to statistics just compiled by F. J. Katz, of the U. S. Geological Survey. The quantity of corundum and emery mined was 10,139 short tons. The quantity of crude emery and corundum marketed was 8702 short tons, valued f.o.b. mines at $95,248. The output was 45% less than that in 1916 and 52% less than that in 1917. The output in 1916 and 1917, however, was abnormally large and was stimulated by the demand created by the war, which required enormous quantities of abrasives for making munitions and other articles needed for military use, and prevented the importation of foreign corundum and emery, the former chief source of supply. Though the employment of substitutes and the increase of imports in 1918 reduced the demand for the domestic abrasives, the output was many times that of normal years before the war.

Corundum was mined in small quantities by two operators in Jackson and Macon counties, N. C.; emery was mined by seven or more operators in the Peekskill district, N. Y., by two in Virginia, and one operator in Macon County, North Carolina.

Gems in Maine

BY F. F. BURR*

The history of gem mining in Maine dates from the discovery of clear crystals of colored tourmaline at Mount Mica, in the town of Paris, about a century ago. Since that time, the quantity of gem material produced must have been, in the aggregate, large. There is, however, no way of estimating this accurately. It is fairly apparent, however, that the output of gems from this and other localities has never approached what it might have been. Lack of systematic mining methods has been the chief handicap under which the gem business has labored from the start. A few producers and dealers have been enterprising enough to overcome the difficulties to some extent, and have developed a fairly satisfactory business.

*Geologist, Central Maine Power Co., Augusta, Maine.

It is impossible to give anything but an approximate estimate of gem production in Maine, and no figures at all are available for the rough material. Cut gems to the value of about $6000 have been reported for 1918, but this figure is known to be too low. The material cut includes tourmalines, colorless, pink, green, and blue-green; beryl, colorless, green, bluish, and yellow, and very rarely pink (caesium beryl); topaz; quartz, amethystine, colorless, rose and smoky; and a small amount of amazonite. An occasional garnet of gem quality is found, and I have seen at least one gem cut from the beautiful and rare purple apatite of Auburn.

Practically all of the gem stones come from Oxford, Androscoggin, and Sagadahoc counties. Discoveries are in many cases merely incidental to operations for feldspar. It cannot be said that the possibilities in any locality are exhausted, as the workings are in all cases scarcely more than surface scratches.

A Campaign To "Get the Returned Soldier and Sailor Home"

The special committee on soldier and sailor employment of the Chamber of Commerce of the United States has issued a special bulletin that suggests an inter-communicating network of commercial organizations designed to facilitate the placing in jobs of men released from the service. Commercial organizations are urged to assume responsibility for seeing that measures are taken to finance the return of discharged men when they have not funds with which to pay their transportation.

"The case of the discharged soldier who is not inclined to go home, but to seek employment elsewhere," says the bulletin, which is issued at the request of Arthur Woods, special assistant to Secretary Baker, in charge of soldier employment, "seriously complicates the whole problem of soldier employment. His motives for not returning home may be of the best and due to a desire for a better chance than his old home and his old job offer him. This is only what we would hope for him, but he is returning at a time when new opportunities are perhaps not numerous. His ambitions must not be killed or discouraged, but he should be brought to realize that he is more highly appraised by his former employer, that his chances of advancement with his old concern may be, as a consequence, much better, and that at any rate he should first reëstablish himself for the interim in his home town, either in his former position or another one, and let the future care for itself.

"All considerations, patriotic, economic, and social, clearly place the responsibility for taking care of such cases with the commercial organizations of the country, who represent the employers. It is the business men who must employ the men, and it is the business men who will feel most acutely the effects of any continued increase in unemployment.

"It will be necessary that definite measures be taken to finance the return of a soldier to his home, when he has, in fact, spent the mileage allowance given him by the Government on discharge for this purpose, and the committee urges that commercial organizations assume responsibility for seeing that this is done. Several methods of meeting the expense suggest themselves. If the soldier is to return to his previous place of employment, his previous employer may be induced to advance funds for his traveling expenses. A Chamber of Com-

merce itself may assume responsibility for financing the return, where necessary, of soldiers who belong in its community, or the Chamber of Commerce in the town where the soldier is may undertake to finance his return home. The soldier, of course, should pay his own way if he has the funds, or his return might be financed in the form of a loan to him. On the other hand, arrangement may be made with some welfare organization or society."

Research Fellowships in Idaho

In coöperation with the U. S. Bureau of Mines and the Idaho Bureau of Mines and Geology, the University of Idaho offers in the School of Mines a number of fellowships. These fellowships are open to college graduates who have had good training in mining, metallurgy, or chemistry, and who are qualified to undertake research work. The income of each fellowship is $720 a year for the 12 months beginning July 1st, 1919.

Fellows will register as students in the University of Idaho and become candidates for the degree of master of science in mining or metallurgy. Their class work will be directed by the heads of the departments of instruction, but the greater part of their time will be spent in research work under the direction of the Bureau of Mines staff resident at the university. The purpose of this work is to undertake the solution of definite problems confronting the mining and metallurgical industries of the State of Idaho. For 1919-20 the following subjects are being considered: (1) Flotation, with especial reference to differential separation of various minerals; (2) availability of Western wood oils for flotation purposes; (3) treatment of the complex gold-silver ores of southern Idaho; (4) ore-dressing problems; (5) mining problems.

Applications, with certified copy of collegiate record, statement of professional experience, and names and addresses of three references, will be received up to June 1, 1919, and should be addressed to the Dean, School of Mines, Moscow, Idaho.

"Public Utility" Housing Societies

According to the London *Daily Telegraph* of Mar. 25, state aid will be accorded to "public utility" societies in Great Britain that propose to erect houses for the working classes only, says a consular report. This assistance will be given in two forms—loans and subsidies. A society may borrow from the state to the extent of three-fourths of its required capital at 5½% interest, the principal repayable in 50 years. The subsidy granted will be approximately 40% of the charges for interest and repayment of principal. After the loan has been repaid, a society may be called upon to devote any profits in excess of 6% toward repaying the whole or part of the subsidy received from the national exchequer. Provision is also made to prevent undue profits from sales of houses erected. One-fourth of the capital will be provided by the employers of the workers for whom the houses are built. Money may be borrowed privately if desired, but the government subsidy will be granted independently of the capital loaned, whether procured from the state or from other sources. These liberal terms are limited to housing schemes to be completed within a period of two years.

It is proposed to charge only a moderate rent, i.e., sufficient to cover costs of repairs and interest on the borrowed capital. The average cost of erection per cottage, with fittings, was at first estimated at $3400, but this has been reduced to about $2675 for a six- or seven-room cottage. A special feature of the utility societies' scheme is the provision made to educate the working classes in the care and upkeep of the new cottages.

Publicity for Mining Districts*

By George A. Laird

With the gradual disappearance of the prospector, it is apparent that steps must be taken to encourage prospecting or to create a campaign of reliable publicity for districts which may be worthy of consideration but are not properly brought to the attention of the mining public.

The larger companies, with a force of field engineers, are frequently offered prospects which do not come up to their requirements, but which might be worth consideration by smaller companies or by individuals. Field engineers are, through the compulsion of professional ethics or by terms of contract, prohibited from discussing their work in a given district, and idleness results, as the property has been "turned down."

Personal paragraphs in the technical bulletins and magazines frequently state that "Mr. So and So has recently made an examination in the This and That District," but the report made is confidential, and the item is of no interest to the profession other than that Mr. So and So has (presumably) received a fee.

Mr. So and So has doubtless obtained some general information which he gladly divulges to his immediate friends—can divulge to anyone—which might be of great interest to the rank and file with whom he has no communication.

It is proposed that engineers, particularly the members of the Mining and Metallurgical Society of America, submit to the secretary, to be published in the *Bulletin*, a short summary of their observations which are not of a confidential nature, a concrete example following:

Field Observations

"In February, George A. Laird visited the Old Hat Mining District, Pinal County, Ariz. The property examined, about 20 miles south of Mammoth, consists of a remnant of Devonian limestone which shows replacement deposits of lead carbonates with silver.

"There is little development in the immediate vicinity, the overburden making prospecting difficult."

Or:

"The Lightning Ridge opal fields, New South Wales, were visited. While not of a nature to encourage a company going into the field, it is of sufficient interest to warrant a day or two as a side trip."

Or:

"Mr. So and So recently paid a visit to the Bull Con District, where conditions in general do not warrant a visit excepting under specific instructions to examine and report."

This last-mentioned item cannot be considered as a direct "knock." There are dozens of districts where such a statement would hold good.

Many times the principal obstacle to prospect development is the prospector himself, but equally as often

*Abstracted from the *Bulletin* of the M. M. S. A., Mar. 31, 1919.

it is because the property does not meet the special requirements of the person requiring the engineer's report.

The general scheme proposed is therefore to publish, in addition to the "personals," an observation column, which implies a fee and definitely states something from which engineers may profit.

The Experimental Treatment of Complex Ore

The following data have been abstracted from a report received by the New Hazelton Gold and Cobalt Mines Co., of New Hazelton, B. C., from the ore-dressing and metallurgical laboratories of the Canadian Department of Mines, at Ottawa. The ore is a complex one, containing molybdenum, cobalt, nickel, arsenic, and gold; and tests were made to determine a scheme of treatment and to forecast possible results from actual operations.

The shipment, which weighed 53,228 lb., was found to contain MoS_2, 1.40%; MoO_3, 0.18%; Co, 1.12%; Ni, 0.60%; As, 8.98%; and Au, 1.24 oz. The object of the test work was to concentrate the valuable materials in the ore and also obtain a separation as far as praticable. As the cobalt, nickel, arsenic, and gold were intimately associated, it was feasible to adopt water concentration and also to obtain a separation and concentration of the molybdenite by flotation.

In the first test the ore was crushed to 20 mesh and concentrated on a Wilfley table to remove the cobalt, nickel, arsenic, and gold. Two products were made, a concentrate and tailing. The tailing was re-ground in a Hardinge mill to 60 mesh and the molybdenite concentrated by means of the Callow pneumatic flotation process. The flotation tailing was re-run over the Wilfley concentrator to remove any cobalt, nickel, arsenic, and gold remaining.

In the second test the ore was crushed to 40 mesh and concentrated on a Wilfley table to remove the cobalt, nickel, arsenic, and gold. Two products were made, a concentrate and tailing. The tailing was re-ground in a Hardinge mill to 60 mesh and the molybdenite concentrated by flotation in a Callow unit. The flotation tailing was re-run over the Wilfley concentrator, and the tailing from the table was considered final and allowed to go to waste.

In the third test the ore was ground in a Hardinge mill to 60 mesh and the molybdenite first floated in a Callow unit. The flotation tailing was concentrated on a Wilfley table to remove the cobalt, nickel, arsenic, and gold, and the tailing from the table pumped to waste. This test was run to obtain a comparison of results between tabling followed by flotation, and flotation followed by tabling.

The actual extractions made on the carload of ore were as follows:

In Table Concentrates: Cobalt, 72.6%; nickel, 87.5%; arsenic, 84.9%; gold, 83.5 per cent.

In Flotation Products: Molybdenite, 54.4 per cent.

These extractions should be improved upon in practice where a closed circuit could be maintained and losses due to handling and slime overflow reduced to a minimum.

As the molybdenum is of secondary value as compared to the other metals present, it is advisable to remove as much as possible of the cobalt, nickel, arsenic, and gold before flotation is practiced to recover the molybdenite. Most of the minerals can be removed at 40 mesh; and, as it is necessary to grind the ore to 100 mesh to recover the molybdenite, it would not be wise to float first and table afterward. The loss in cobalt, nickel, arsenic, and gold due to fine grinding would not compensate for the higher extraction of the molybdenite.

From the test work conducted, it is apparent that the procedure to follow on the concentration of this ore would be: The crude ore should be crushed in a jaw-breaker to 1½ in. or 1 in. and ground in a wet ball mill in circuit with a classifier to about 40 mesh, and concentrated on tables of the Wilfley type; the table tailing re-ground in a ball or tube mill to 100 mesh, in circuit with a classifier; and the molybdenite floated in an oil-floation unit. The tailing from the flotation unit should be concentrated on slime tables or vanners.

Oil in the Simi Valley, Southern California

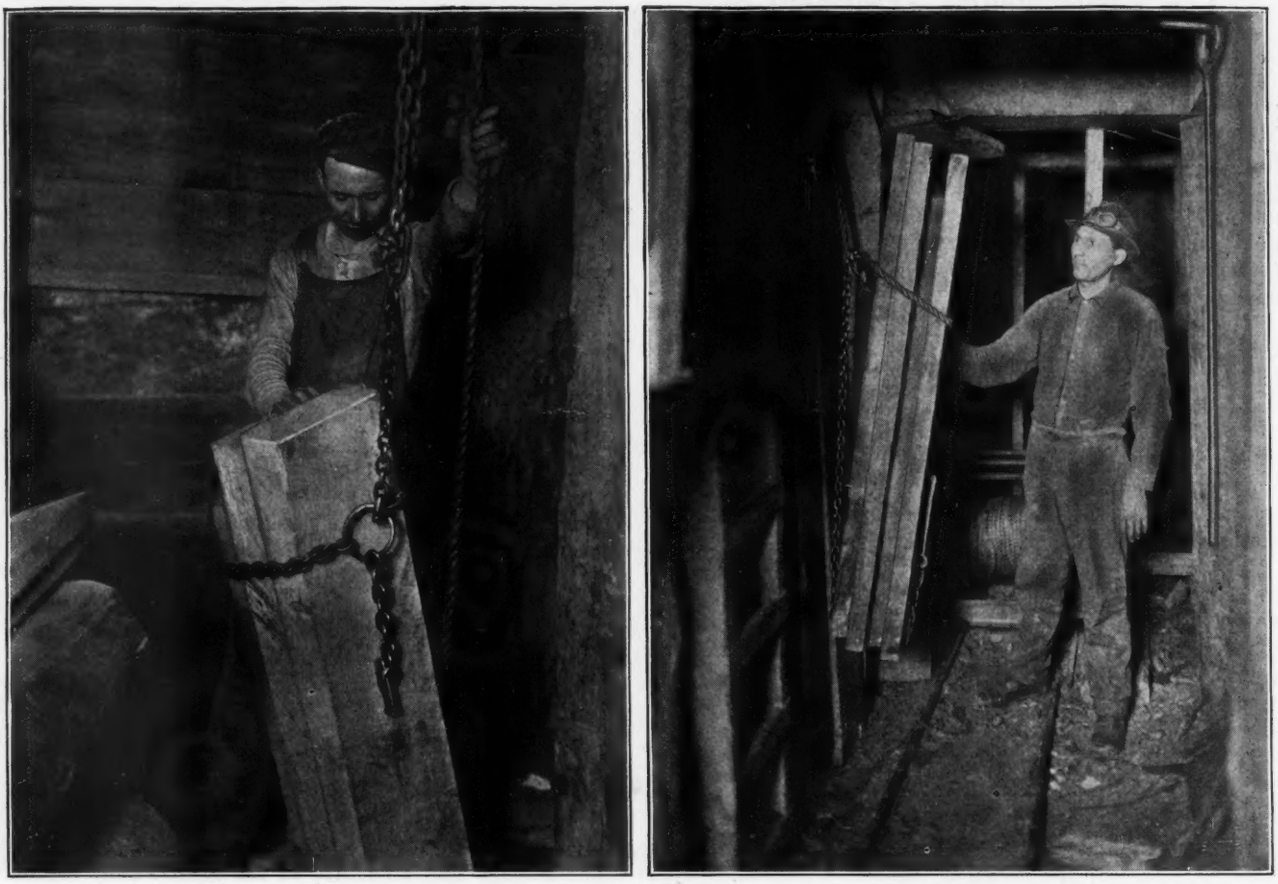
Recent successful explorations for oil in the Ranger district, in Texas, afford a striking example of achievement due to persistence combined with science, and another example, not so striking, perhaps, but nevertheless instructive, is seen in the similar successful work done in the Simi Valley, Ventura County, Calif., 30 miles northeast of Los Angeles. The first wells sunk in Simi Valley were drilled in 1900 along a fault, or "break," close to an oil seepage about 2½ miles north of Santa Susana, and were not promising. Later, on the advice of geologists, a test hole was sunk on an anticline in Tapo Canyon. The test gave good results; a well was brought in at a shallow depth, and the Tapo Canyon field was thus discovered. Since then two companies have been operating in this field, and have put down about 50 wells, only a few of them failures. The oil is of high grade, but the aggregate output is relatively small.

The geology and structure of the Simi Valley region have recently been mapped and described by W. S. W. Kew, of the U. S. Geological Survey, in a report entitled "Geologic Structure and Oil Resources of the Simi Valley, Southern California," published as Bulletin 691-M of the Survey. The report contains a map showing the geologic formations exposed at the surface in this region and cross-sections showing the structure or form of the beds underground. These sections, which were derived from an examination of the beds exposed at the surface and from logs of wells, show how and where the beds are folded and broken.

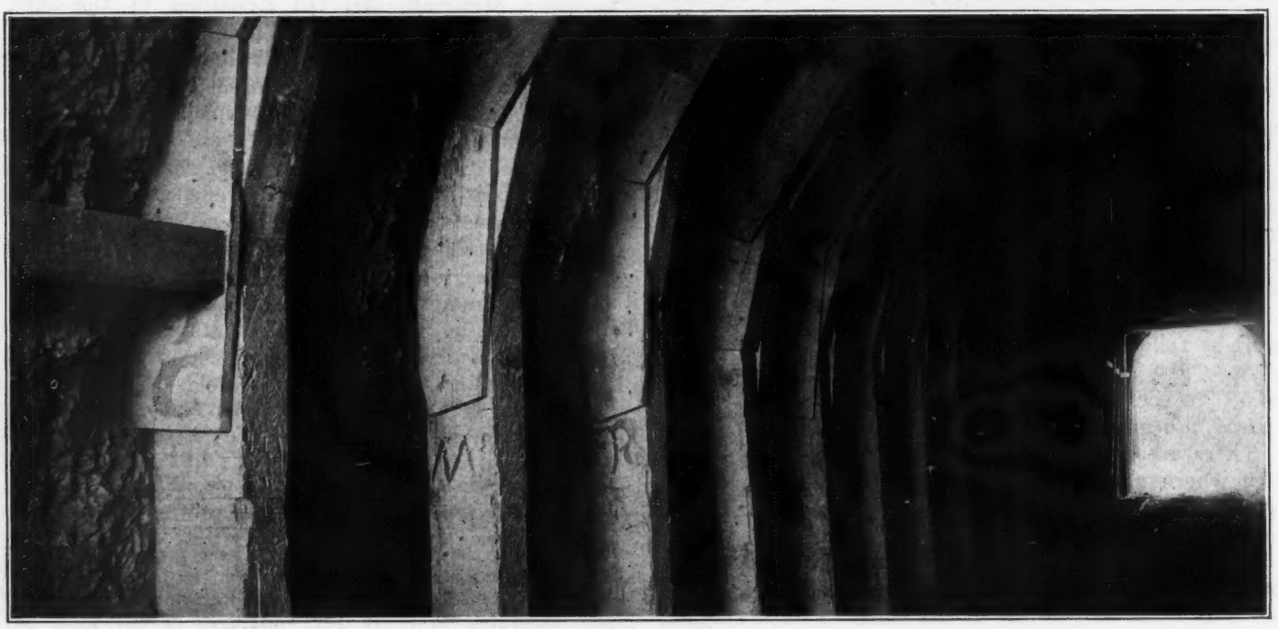
Mr. Kew suggests that oil may be obtained in other parts of the region and recommends that a test hole be put down on an anticline in Las Llajas Canyon, near the south side of the Santa Susana Mountains, where there are oil seeps and where the geologic conditions are similar to those in the Tapo Canyon field. He also suggests that it is possible that the Tapo Canyon field may extend further west.

The Aluminum Ore Co., East St. Louis, Ill., will soon put into operation a steamship service for the purpose of carrying bauxite from South America to either East St. Louis or the company's Baltimore plant. The company has three steamships of 3500 tons' capacity each, to be delivered in the near future for this service. It has not yet been decided, according to C. B. Fox, manager of the East St. Louis plant, which of the company's plants will be enlarged.

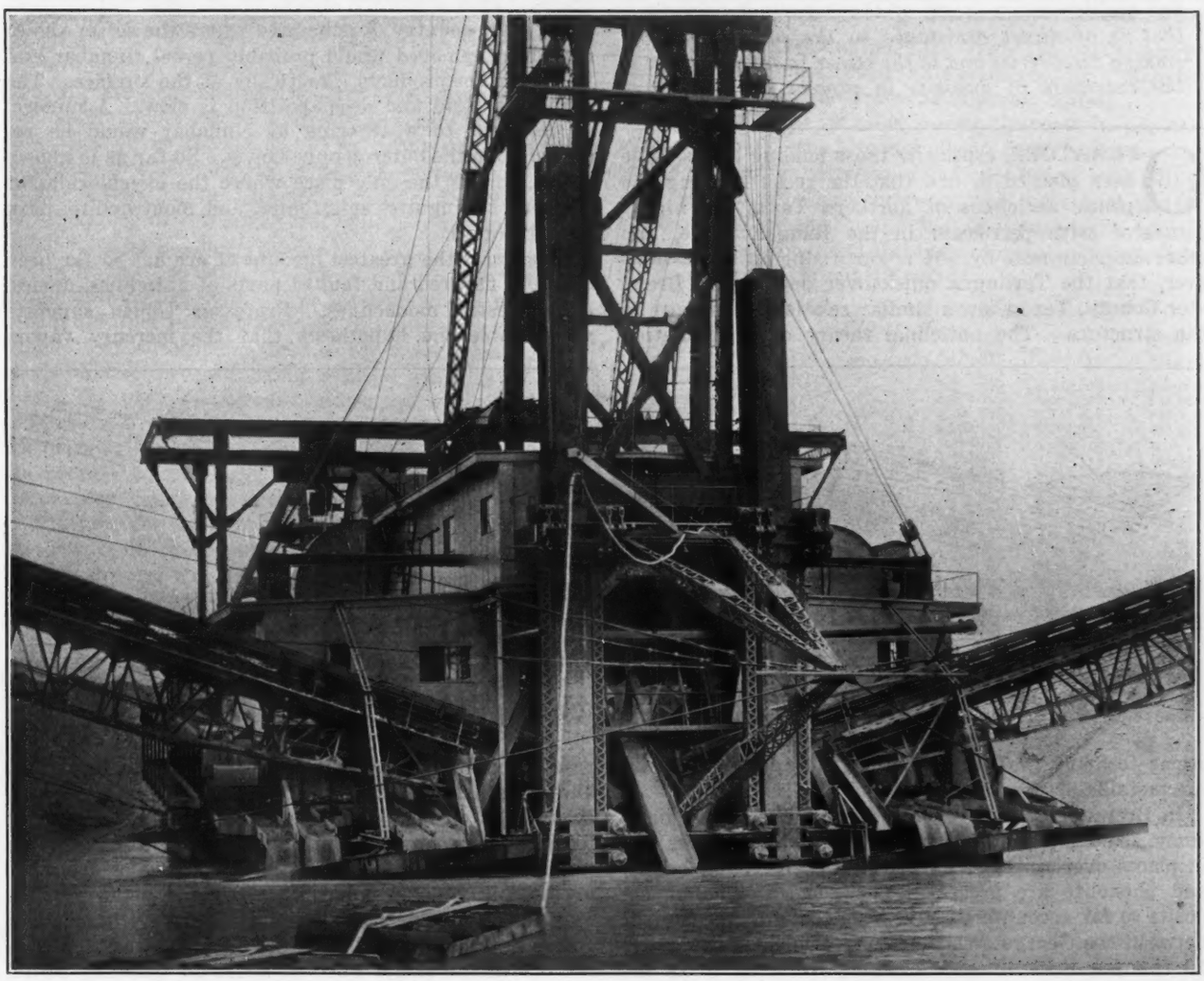
Photographs From the Field



WRONG AND RIGHT WAYS OF LASHING TIMBER FOR HOISTING OR LOWERING
Illustration at right shows the use of a successful timber hook. Published through the courtesy of the *Anode*.



METHOD OF TIMBERING A WAGON-ROAD TUNNEL AT VIRGINIA CITY, NEVADA



YUBA NO. 16, ALL-STEEL, TWO-STACKER DREDGE IN THE YUBA RIVER, CALIFORNIA, DREDGING GOLD-BEARING GRAVEL AND RECONSTRUCTING THE RIVER CHANNEL

This dredge is equipped with 18-cu.ft. California-type buckets, and digs 80 ft. below the water line. It was designed and built by the Yuba Manufacturing Co., and is owned and operated by the Yuba Consolidated Gold Fields. The dredge began digging Apr. 1, 1917. The upper view of the dredge shows the bow gantry and approximate full length of the digging ladder, carrying 100 buckets, digging at shallow depth. Approximately the full length (225 ft.) of the starboard tailing stacker (inactive) and the upper end of the port tailing stacker (active) are shown. The lower view shows the stern gantry, steel spuds—one lowered, the other raised—and the position on deck of the two tailing stackers, which stand at approximate right angles to the hull. The attachments controlling the spuds at the head of the gantry are shown in detail; also the safety platform and spud case-keepers, whose tops reach the point of connection of the tailing stacker supports. The electric power cable is plainly to be observed in the foreground, carried by floats built for the purpose.

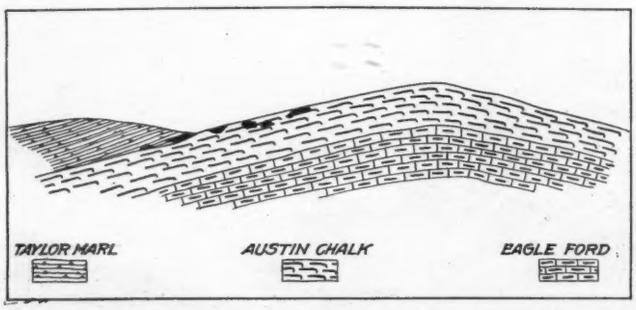
The Anticlinal Theory and Some Quicksilver Deposits

By WILLIAM H. EMMONS*

The following article is a review of "The Anticlinal Theory as Applied to Some Quicksilver Deposits," a bulletin by J. A. Udden, University of Texas, Bureau of Economic Geology and Technology, Division of Economic Geology, No. 1822, Apr. 15, 1918. Dr. Emmons points out that the theory should be of considerable aid as applied to the prospecting of certain areas where the structural conditions are favorable. Ore has been found in the fissured and faulted parts of anticlines, domes, and arrested monoclines. The relation of structure and ore deposition is one of the important subjects that is of direct assistance to the prospector in making discoveries and to the miner in following out the extension of deposits in process of working.

OPERATORS, especially those holding leases, have been pleased to find that the rocks forming the gentle anticlines of northern Texas are highly saturated with petroleum in the Ranger, Duke, and other districts near by. It is surprising to learn, however, that the Terlingua quicksilver deposits of Brewster County, Tex., show a similar relation of deposits to the structure. The anticlinal theory of accumulation seems to apply in Texas, whether the mineral deposits are metallic or nonmetallic.

In Brewster County, western Texas, Cretaceous limestone, shale, and marl are cut by Tertiary intrusives and in places overlain by tuffs and flows. Rhyolite, basalt, and phonolite are present. The richest cinnabar deposits so far encountered have been found at the contact between the Georgetown limestone (which is the upper 50 ft. of a thick limestone usually referred to as the Edwards) and the overlying Del Rio clay. The next richest horizon is the contact between the Buda limestone and the overlying, less penetrable flags and shales of the Eagle Ford. In the Eagle Ford itself, which in this region measures at least about 600 ft. in thickness, and consists of beds rapidly alternating from compact limestone to black shale, the distribution of ore frequently shows a direct relation to these alternations. Even in the thin layers of these beds it has been found that pockets of cinnabar frequently underlie layers of shale.



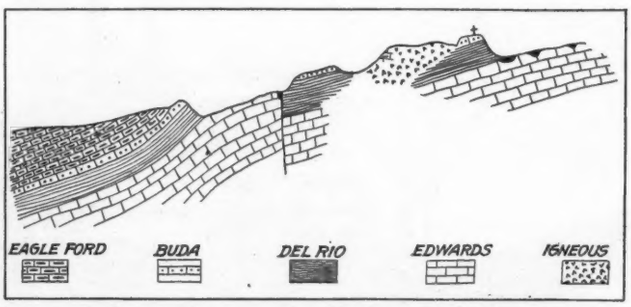


FIG. 1. DIAGRAMMATIC SECTION WEST OF CHISOS MOUNTAINS, BREWSTER COUNTY. KNOWN OCCURRENCES OF CINNABAR ARE INDICATED IN SOLID BLACK. FIG. 2. DIAGRAMMATIC SECTION EXTENDING FROM SOUTH—SOUTHWEST TO BREWSTER COUNTY, TEX. KNOWN OCCURRENCES OF ORE-BEARING ROCKS ARE INDICATED BY SOLID BLACK

Cinnabar Deposits Terminate Upward Against Shale

Turner[1] long ago showed that some of the large cinnabar deposits in the Lower Cretaceous limestone termiate upward against shale. Professor Udden shows that the position is much the most common one. The cinnabar replacements of limestone are along fractures and fissures, and are grouped along anticlines or near their crests. This discovery should be of great aid in prospecting the country, for the area where the softer shales have been removed would probably reveal cinnabar and its alteration products, practically at the surface. The country is arid and decomposition is slow. A mineral so resistant to weathering as cinnabar would be removed from the outcrop only slowly. So far as is known to me, this is the only place where the oxychlorides of mercury terlinguite, eglestonite, and montroydite[2] have been reported.

In general the greatest amount of ore has so far been found in fissured and faulted parts of anticlines, domes, and arrested monoclines. Professor Udden suggests as probable the hypothesis that the mercury vapors rose through the cracks and fissures in the limestone, and were halted below the shale at the highest points, that is, at or near the crests of anticlines. Possibly bituminous matter in the anticline had a bearing on precipitation. He notes that all of the shales are more or less bituminous and contain organic matter. This may have aided in the precipitation of the quicksilver fumes as sulphides. Oil has been found associated with the ore in the Eagle Ford in sufficient quantity to aid materially in its reduction in the furnace, as detailed on p. 9 of Professor Udden's paper.

There are many examples of deposits of sulphide ores of metals less volatile than mercury that are localized in anticlines or saddle reefs, and that have apparently been deposited by ascending thermal waters. The saddle

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[1]Turner, H. W., "The Terlingua Quicksilver Deposits," *Econ. Geol.*, Vol. 1, p. 265 to 281, 1906.

[2]Hill, B. F., "The Occurrence of Texas Mercury Minerals," *Am. Journ. Sci.*, 4th ser., Vol. 16, p. 251, 1903.

reef, or anticlinal type, is common in the eastern hemisphere. Examples are found at Bendigo and Castlemaine, Victoria; Hargraves and Broken Hill, New South Wales; at Mysore, India; at Rammelsberg, Germany, and at many other places.

In North America, deposits of sulphides concentrated at the crests of anticlines are found at Philipsburg and Elkhorn, Mont.; at Tombstone, Ariz., and in the Kelly district, New Mexico; at the Clover Leaf mine, Black Hills, S. D., and in the gold measures of Nova Scotia. Although some of the deposits named appear to represent folded bodies that once were tabular, or replacements of beds that were once tabular, many of them seem to be concentrations from rising solutions where localization was controlled by structure. To this class the Terlingua deposits evidently belong. This district is the only one known to me that contains mercury deposits which are clearly related to anticlinal folds.

Nipissing Mining Co., Ltd.

The report of operations of the Nipissing Mining Co., Ltd., for the year ending Dec. 31, 1918, shows that the production amounted to 3,701,416.38 oz. of silver, of a net value of $3,973,196.63. The profit on operations amounted to $2,596,095.65, or 64.25% of the gross value of production. Total shipments to Dec. 31, 1918, were 52,945,197.24 oz. of silver, for which a net return of $32,253,226.44 has been received.

The high-grade mill treated 1073 tons and the low-grade mill 80,274 tons. The method which has been used heretofore in the treatment of high-grade ores, and which gave satisfactory results for seven years, is an amalgamation process, using a large quantity of mercury. The price of mercury before the war was $33 to $39 per flask of 75 lb. Demand for war purposes raised the price to $130 per flask. This increased the cost of the process to such an extent that it was decided to discontinue amalgamation and rely on cyaniding alone, after giving the ore a preliminary treatment with bleaching powder in the tube mill. The necessary apparatus for this process was installed in the low-grade mill at a small cost, and in August, 1918, the old high-grade mill was shut down. The new process is working smoothly and will be used as long as it shows a saving over amalgamation. The bullion shipped averaged 998 fine, and amounted to 190 tons. Residue shipments were 2157 tons, assaying 9.03% cobalt. The demand for this material is good, at much higher prices than have been received heretofore.

In the low-grade mill the ore is crushed by stamps in cyanide solution and goes to the roughing tables without classification. The tailing is classified; the sand is recrushed in tube mill; and the overflow from the classifier goes to the fine-sand tables. The tube-mill discharge is returned to the classifier; and the tailing from the fine-sand tables is cyanided. By this method 48% of the silver in the ore is recovered in the form of concentrate, 40% as precipitate from the cyanide plant, and 12% goes to waste. The concentrate is re-treated with the high-grade ore in the high-grade mill, and the precipitate from both treatments is sent to the refinery, where it is converted into bullion. This process gives a better extraction and at less cost than can be obtained by cyanide alone on the quality of ore now being produced. Due consideration must be given to the question of the value of the cobalt in the concentrate.

The ore reserves as of Dec. 31, 1918, showed a total of 123,837, of an average content of 48.5 oz. of silver per ton.

The dividends declared and paid during 1918 amounted to $1,215,000. The treasurer's report shows that the company has a net surplus of $3,441,702.54.

Monthly Copper Production for 1919

The table which appears herewith is compiled from reports received from the respective companies (except in the cases noted as estimated), together with the reports of the U. S. Department of Commerce as to imported material, and in the main represents the crude-copper content of blister copper, in pounds.

Production of the United States by months since the beginning of the year was as follows:

January	135,733,511
February	111,649,512
March	102,040,460

The item "Alaska shipments" gives the official figure of the U. S. Department of Commerce, and includes Kennecott production from its Alaskan mines.

The grand total includes, under "Imports in ore and blister copper," the production of such companies as Granby, Cananea, Braden, Cerro de Pasco, and Chile. As a matter of record, however, the individual figures are given after the total. We also report the copper output of the Boleo and Katanga companies, which does not come to the United States.

MONTHLY CRUDE-COPPER PRODUCTION, 1919

	February	March	April
Alaska shipments	5,176,033	1,471,398	1,471,398
Arizona:			
Arizona Copper	3,360,000	2,800,000	2,400,000
Calumet & Arizona	6,612,000	4,602,000	3,822,000
Cons. Ariz. Smelting	1,000,000	720,000	770,000
Inspiration	6,600,000	6,700,000	6,900,000
Magma	1,211,175	1,000,212	.....
Miami	4,462,578	4,551,115	4,489,748
New Cornelia (a)	2,014,000	1,980,000	2,000,000
Old Dominion	2,360,000	2,574,000	2,385,000
Phelps Dodge	7,410,000	6,434,000	6,560,176
Ray	4,150,000	3,792,000	3,650,000
Shattuck Arizona	376,166	2,452	*Nil*
United Verde	2,850,000	*Nil*	*Nil*
United Verde Extension	1,239,120	*Nil*	*Nil*
California:			
Mammoth	1,506,000	1,475,000	1,386,000
Michigan:			
Calumet & Hecla	9,263,868	9,652,053	8,554,113
Other Lake Superior (b)	6,500,000	6,500,000	6,500,000
Montana:			
Anaconda	12,400,000	13,900,000	13,750,000
East Butte	633,560	1,700,230	1,347,580
Nevada:			
Mason Valley	947,336	*Nil*	*Nil*
Nevada Cons.	4,150,000	3,650,000	3,763,000
New Mexico:			
Chino	3,552,676	3,770,000	3,498,747
Utah:			
Utah Copper	10,335,000	8,366,000	9,420,000
Eastern smelters (b)	1,400,000	1,400,000	1,400,000
Total reported	99,509,512	87,040,460	.....
Others, estimated	12,140,000	15,000,000	.....
Total United States	111,649,512	102,040,460	.....
Imports: Ore and concentrates, etc.	13,824,200	10,146,979	.....
Imports in blister, etc	33,369,626	49,564,536	.....
Grand total	158,843,338	161,751,975	.....
British Columbia:			
Granby Cons.	2,610,737	.....	.....
Mexico:			
Boleo	1,807,680	2,039,520	.....
Cananea	3,000,000	3,200,000	3,000,000
Phelps Dodge, Mexican properties	1,775,000	1,900,000	1,702,000
Other foreign:			
Cerro de Pasco	4,586,000	4,838,000	2,780,000
Chile	5,376,000	4,568,000	.....
Katanga	3,877,890	3,262,800	.....
Backus & Johnston	1,642,898	2,144,825	.....

(a) Only electrolytic cathodes are entered. New Cornelia also produces some copper from ores sent to Calumet & Arizona smeltery. (b) Estimated.

"Nothing Is So Local as not to be of some general benefit."—(Lincoln). Thrift and War Savings Stamps not only bring individual or community prosperity; they bring national prosperity.

Labor and Gold Mining in South Africa

An excerpt from an address delivered by Sir Evelyn A. Wallers, president of the Transvaal Chamber of Mines, at the annual meeting of the Chamber of Mines, Mar. 24, 1919. Labor unrest, decrease in labor efficiency, and the increase in the cost of mining and milling supplies have adversely affected the gold-mining industry in all parts of the world. What is being thought about this situation and what is being done in other gold-mining countries are of vital interest to our own gold miners. The address is a well-balanced statement of conditions in the most important gold-mining area in the world. The difficulties in South Africa find a somewhat similar parallel is our own gold-mining areas, and the gold-mining industry there, as well as here, is in urgent need of careful fostering if it is to continue to hold the important place that it has won among the great and essential industries.

TODAY we are assailed on every side with new formulæ for the solution and removal of industrial unrest and discontent, and many schemes are put before us of a more or less revolutionary character and of varying degrees of danger and complexity. There may be, therefore, a tendency for the issue to become confused, and, for those of us who are honestly trying to find a way out, to feel that we are in a kind of labyrinth. In that condition of mind, we might fall into the error of thinking that there is some rapid and drastic method of upheaval which will achieve what we all desire; in other words, that a short period of feverish thinking and doing will solve the problems. I am convinced this is not the case and that there is no short-cut.

Our salvation, employer and employed, lies in the apparently simple yet really very difficult work of building, piece by piece, with great persistence and infinite patience, upon the basis of steadily developing mutual understanding and desire for mutual good will. Let us make no mistake about it, gentlemen. Any suggested panacea for our troubles, whether it comes from employer or employed, that leaves out this essential factor, will never prevail; and it is just in so far as capital and labor in this industry have realized this great truth, and the measure in which we have jointly carried it into effect, that we shall find the reason for any degree of improvement in our industrial atmosphere that may have been achieved.

I believe the more complex the situation appears, and the more diverse the solutions that are offered, the more necessary is it for us to get a firm hold of this simple principle that must be in our hearts as well as in our heads—a constantly deepening sense of responsibility in industry to one another and to the community. The joint efforts in this direction of the workmen in this industry, their representatives, and ourselves, have doubtless on many occasions failed to produce the results hoped for and desired by all concerned, but, nevertheless, without doubt we have progressed along this line, and all betterment has sprung from it.

The first and very important step was the initiation of frequent round-table conferences, where facts, opinions, and views are frankly and openly discussed and set out for analysis. Here is to be found the beginning of understanding, the commencement of a knowledge of one another, and, what is perhaps more important, a knowledge of ourselves, and here, also, is the start made in removing—even though it be but a little—that appalling mutual distrust and suspicion. Personal and direct contact, and consequent proper understanding between employer and employed, is undoubtedly the secret of success in any business enterprise, and is one of the great difficulties with which we are faced in a large industry like ours. It is clearly physically impossible under modern industrial conditions. But this important fact emerges, however, and it is one upon which I, personally, hold very strong convictions: that is, if the men who are responsible for and have been placed in charge of the administration of industry show clearly that their line of thought and conduct is based on the broad principles I have mentioned. that influence will permeate the whole of their organization, and they will attract to them, and see that they get in the various degrees of management of their departments, men who similarly hold and practice those principles. And, unfortunately, the opposite will also prevail if men who are in positions of final authority have lack of imagination, and insufficient human regard for those who work with them, continuing to think of them simply as cogs in the industrial wheel. They are a menace to the community, because the tone they set and the influences they necessarily exert have far-reaching results. Our responsibility as employers, therefore, is great.

Danger of Extremists

And as it is with extremists who may exist among employers, so also is it with the similar type of man who may exist among employees. His line of thought and action is also extremely inimical to the interests of his fellow workers and of the community as a whole; he persists in an endeavor to discredit the intentions and actions of the employer who is out to do the right thing; he is, as far as can be seen, against all moderation, and he advises his fellow workers that salvation is only to be found in extreme and revolutionary methods, regardless of discipline and of law and order.

I have referred publicly on many occasions to the extremists among employers and employees, and I make no apology for doing so again, because I feel that they constitute the real danger. They are the definite obstruction to well-ordered, well-considered progress; they seek to obscure the identity of interest that in fact exists, and the coöperation between employer and employed that must be realized if really good industrial and social conditions are to be secured. And these things cannot and will not be obtained except as a result of everybody pulling his weight in the boat. It is foolish for us to imagine otherwise.

The aspirations on the part of workmen the world over toward reasonable working hours, the maintenance of good wages, and a definite and improved status in industry are perfectly legitimate and right, and every thinking man in the employing and managing sections of the community recognizes that fact.

That capital, for the most part, has been in the past wanting in the realization of its responsibility in these respects, and in other even more important aspects, is unfortunately true; indeed, the industrial and social

atmosphere, in Europe especially, and perhaps here, too, in a measure, is sufficiently eloquent evidence of that fact. But the only useful purpose we can serve by looking back is to realize our errors. The period of enlightenment that has come has surely illumined the minds of both employers and employed, enabling us to see clearly enough, not only that these things are right and must be done, but also that what will make the doing of them possible is more thoughtful, better-organized and more scientific management on our part, and better work, increased loyalty, and greater effort on the part of those who work with us. There lies the way, I am convinced, to the working hours and the wage; to the educational and social conditions that will provide reasonable leisure and comfort, that will eliminate the fear of unemployment that at present wrongfully hangs over the heads of many men and women, and that will make possible the replacement of the material loss and destruction due to the war, and the successful shouldering of the present great burden of debt.

Hours and Wages

Working hours and wages in industry must naturally be taken together and considered broadly as one question. It may be that in our industry there is somewhat less pressure on this question, because our wages and general 48-hour week, together with our holiday scheme on pay for all employees, and other working and living conditions, are probably in advance of most industries in other parts of the world. But it is, nevertheless, a fact that there is considerable pressure on other industries in this country for fewer hours, accompanied by either the maintenance of, or an increase of, the existing wage; and as most industries in the Union—and its prosperity as a whole—are allied to or alternatively rest upon the successful carrying on of the mining industry, it is vitally necessary for us, in the interest of all, to study the question with the utmost care. It seems to me that the extraordinarily high and far-reaching demands that are being put forward on behalf of the employees of some industries cannot have received the thorough consideration of the unions that are urging them, because I know that in the unions there are very many men who are keen students of industrial and social problems. It is therefore inconceivable to me that they will fail to realize the extreme danger of acting as if there were an unlimited margin in any industry, or in the wealth of the community, from which increases in wages and reduction in production, through shorter hours, can be met.

A recent statement by the Right Hon. J. H. Thomas, M.P., the leader of the British railway men, on this same subject must have been widely read and commented on. You will remember that he said:

" . . . People who tell you there is unlimited wealth somewhere, which you will collect if you can only find the key, are leading you on a false path. The truth is that the only wealth is the wealth we produce, and unless we keep that fact clearly in mind we are going headlong to disaster."

That is a strong statement, but, I think, a very true one, because increased wages clearly must be met out of increased production or increased efficiency.

It is sometimes argued that shorter hours mean greater production; and it is without doubt that the long hours worked in industry in years gone by were wrong and unsound in the extreme. Marked improvement has, however, been made since then, and obviously, with a continued reduction of working hours, a stage is reached when any further decrease means a reduction in production per man employed. In most industries, of course, an increase in wages is followed by an increase in the cost of commodities produced, and a vicious circle is then entered where further rises in the cost of living follow upon increases in wages. And, besides the effect of an increase in wages in itself automatically producing an increase in prices, it must always be remembered that the commercial community, when the cost of the goods it sells or its own working costs increase, usually adds somewhat more than this increased cost to the price at which it retails the goods to the community. The figures just published by the Cost of Living Commission show this very plainly: whatever increase took place in the cost of living of the individual merchants, in the working costs, and in the cost of their goods to them, it appears plain from these figures that considerably more than the equivalent was obtained from the community, more particularly by the wholesale merchants.

It may be suggested that to prevent such exactions the government or the community should undertake all the services at present rendered by these individuals, but I am sure that this procedure would not meet the difficulty. Instead of excessive individual profits we should then run a great risk of waste and inefficiency ensuing. The correct procedure, to my mind, is, while maintaining the initiative and efficiency (in individual businesses) which are admittedly obtained by the present system, to provide government with the necessary assistance that would enable producers and consumers to eliminate the unnecessary middlemen organizations which, in too great a measure, interpose themselves between the two, and by legislation to prevent the exploitation of the community.

For reasons which will be clear when considering the effect of increases in wages on the gold-mining industry, it is peculiarly important from the point of view of that industry that unnecessary increases in prices of commodities should be prevented, whether in the case of the stores purchased by the industry itself or in the goods consumed by its employees. Increases in the prices of the latter produce a demand for higher wages, the effect of which will presently be discussed. I state elsewhere that the increased cost of the stores consumed by the mining industry at the present time, as compared with their cost before the war, was about £4,000,000 per annum. No doubt the greater part of this is unavoidable increase due to war conditions (some of it being caused by necessary increases in wages in other countries), but an appreciable portion is an increase due not so much to profiteering on the part of manufacturers (certainly not the mining material merchants), but to inter-trading between agents. The more one considers the effect of profiteering and high cost of living on the industry, the more evident it becomes that the interests of the gold-mining industry and its employees are more identical in these respects than the interests of the employers and employees in almost any other industry.

Reverting again to the vicious circle in which increased costs of commodities follow upon each increase in wages, it is probably true that when purely internal trade only is concerned, and there are equal real wages throughout the country, this process could go on for a

long time without serious injury, and possibly without greatly affecting production. When, however, the trade in question is largely an export trade, then clearly, unless the workers in the competing countries are employed under equivalent conditions, large increases in wages and costs will speedily destroy that trade. And even more clear than this export trade position is the position of an industry like the gold-mining industry where extra costs cannot be "passed on," owing to the fixed price of gold. If our increased wages are not met by increased production of efficiency, they must clearly be provided out of some existing margin of profit—or they cannot be paid. Were it possible to increase efficiency and the rate of production per unit employed, such a margin might be created.

Equally clear is the position of our mining industry on the question of fewer working hours. We know that it is necessary in underground working to get through certain definite tasks each day in order that the round of mining operations may be completed. In our underground work, as you know, natives are employed on the breaking of the rock, and they are not permitted to commence work until the working places have been examined by the European gangers to insure safety, and, further, the native workmen have to cease working before the end of the shift and in sufficient time to allow of charging up and blasting. The result, therefore, is that their actual working time on drilling the rock which must be broken in order to maintain operations is surprisingly short.

I would not say for a moment that we have yet done all that it is possible to do in the way of improving our efficiency of administration and the utilization of explosives and stores, but our margin in this respect is probably not great. But the point, therefore, is this—that unless our decreased working hours and our increased wages are accompanied by increased production and efficiency, they clearly have to be met out of the dividends paid to shareholders in our industry. It is a fact, however, that a considerable portion of the Rand shareholders' dividends are, unfortunately, either practically or actually non-existent, and it is not necessary for me to elaborate that point; and even taking the industry as a whole you will find on investigation that it is now paying under 2½% on the capital that has been invested in it.

Happily, the substantial increases in wages, the reduction in working hours, and the war bonuses, etc., paid during the last few years have not, so far, resulted in the closing down of any mines; but so far as our information goes at present we have certainly pushed matters in the interests of our employees to the limit that is justifiable for their sake and for the sake of the community as a whole; and I shall presently give you some figures which indicate the significant and great reduction in working profits earned and dividends paid by the gold-mining industry.

In some cases the position has been partially met by working only the richer ore in the mines, or by working it in a greater proportion than would otherwise have been done, thus shortening the life of the industry. This is a serious state of affairs, to which I have referred before on many occasions, and is, I am sure, clearly realized by our employees and the community generally. I am convinced, therefore, that on these important questions of working hours and wages we must all proceed with extreme caution and moderation, and I submit that we are today able to do so because, on the whole, our conditions in these respects are good.

Industrial Unionism and Control of Industry

A feature of the labor movement today which is coming into considerable prominence, and to which I should like to refer for a moment, is the indication by some leaders of trades unions that what is known as industrial unionism is the right objective for workmen and that following it in sequence will come the control and management of industries by the employees in those industries. Those views are usually accompanied by the opinion that the employing and managing sections of the community should be "eliminated." I have had the opportunity of discussing these questions with trade unionists who support them, and I have read as much as I have been able to about them during the past six months or so. I am bound to say that I doubt if the views current at the present time on these subjects have been thoroughly digested by those who put them forward, and I hold to my view that neither side—neither capital nor labor—can carry on without the other, that there is definite identity of interest, and that justice and common sense will prevail in the joint working of that interest. The question of industrial unionism or an amalgamation of unions is, naturally, a matter for the unions themselves to decide; but I imagine the breaking down of old-established barriers between craft unions is a subject that will require a good deal of thought and attention on the part of workmen, and take a good deal of time.

The initiative by which industries are started and expanded is, as a rule, the initiative of capital and the employer, and without it, I venture to think, any country would be in a state of stagnation. The system upon which industry is based is undoubtedly susceptible of much abuse, and has, indeed, produced in many cases conditions that have been unfair to workmen, but although it has worked badly in those instances, it has nevertheless worked, and is, and will prove to be, I firmly believe, capable of such improvement as will provide, for all concerned, proper and just conditions of living, if employer and employed together proceed on well-considered lines. The substitutes that have been put forward for the existing basis upon which industry works have always, it seems to me, been stated in somewhat vague and uncertain terms, and the comment that has been made upon them is, I think, fair comment, nemely, that a new heaven and a new earth cannot be achieved by a rapid process of "house-breaking followed by jerry-building."

The Lesson of Russia

Is it not a fact beyond dispute that today in various parts of Europe to some extent, but particularly in Russia, is being carried out an experiment on a huge scale of extreme social and industrial revolutionary methods? And with what tragic results to all concerned! Those unfortunate people, living and working under conditions that must have been monstrously unjust, and with hundreds of years of similar oppression behind them, were genuinely seeking to find a way out. The leaders who eventually arose were the wrong ones, and step by step the full extent of the calamity has been realized, until today the condition overshadowing all others resulting from chaos is the starvation that breeds madness—and that in countries teeming with popula-

tion and extraordinarily blessed in natural resources. Surely we should believe that it is not for nothing that this tragedy is being worked out, but rather that it is for the purpose of impressing upon us all, employers and employed alike, certain lessons that stand out in the most vivid and striking manner.

Distribution of Wealth

While on this subject generally, there is another point that I would like to refer to briefly, and that is the contention on the part of some of the leaders of the labor movement that the distribution of wealth among the inhabitants of South Africa—I presume the white inhabitants are referred to—is extraordinarily unfair and unequal. I have no doubt the amassing of huge fortunes by individuals in this or in any other country that may have happened in the past will be taken care of by taxation or other means in the future, but let us look at the facts that emerge clearly from a perusal of the Income Tax Commissioner's figures in this country. You will find that, whatever is the position elsewhere, this particular idea of the unequal distribution of wealth is much exaggerated, so far as South Africa is concerned, because, as you will notice, if the excess over £300 of all South African incomes, including the incomes of companies, is taken and distributed over the whole adult European male population, the result of that distribution would be an addition of approximately £105 per annum to the then existing income of each. And this calculation leaves out of account the single woman, who is surely entitled to her share, and the native inhabitant of this country, who also must not be overlooked.

Unemployment

As regards the problem of unemployment, it appears to me that the question should be considered in two sections; first, unemployment which arises in normal times, and, second, that which will occur through the "carry over" from war to peace. The gold-mining industry, if it has a reasonably adequate supply of native labor, is in the satisfactory position of maintaining the number of Europeans who were employed under normal conditions (prior to the war), and, indeed, would be able to provide employment for an even greater number than that indicated if it had in its employ also an increased force of native workmen. As regards the second class of unemployment—unemployment following the war—this is clearly a national question, and like the necessity of an unemployment insurance fund, must certainly be dealt with by the state and community as a whole.

Industrial Conferences

I do hope that the necessary series of industrial commissions and conferences will take place, with equal representation of employers and employed; because in completing my remarks on these vital subjects I would reaffirm with all earnestness to you, and to the men with whom we work, the belief that it is possible to achieve by coöperation between employers and employed all the good results that are promised by the advocates of extreme and revolutionary schemes, and to do so without destroying and disorganizing industry and the peace and prosperity of all. And the starting point and the basis are to be found along the lines of the principle I put to you at the beginning of this address, and to which—I fear after considerable digression on my part —we return: that is, the development of mutual good will and the realization of joint responsibility.

Fortunately we were able to start the method of round-table conferences—the initiation of conciliation and reference boards—some years ago, and from what I have said you will realize that in my view the fact that we are perhaps somewhat ahead of industries in other parts of the world in regard to working hours, working conditions, minimum rates of pay, and holidays to all employees is entirely to be attributed to that beginning in mutual understanding and the realization of one another's difficulties and points of view. The greater part of our time throughout the year has naturally been employed in the adjustment and settlement of those industrial matters, and I do not purpose to refer to all the particular pieces of work in detail. Broadly speaking, there has been a steady improvement in conditions right along the line.

Since the adoption of the board-of-reference principle, there have been a great number of meetings of these boards of reference and conciliation, and, on the whole, the principle has worked well. Owing, I think, largely to the want of proper understanding of the details of the agreement between the unions and the Chamber, a few instances arose during the year where employees ceased work without submitting the matter in dispute to a board, as required by the agreement. As a result, we held a conference consisting of a large number of representatives of the executives of the various unions affiliated with the South African Industrial Federation, at which the point was fully discussed. We wished to ascertain definitely whether the unions desired to continue this valuable board-of-reference principle, and the representatives of the various unions unanimously reaffirmed that boards of reference should be held before any drastic action, such as a strike, took place. Since that conference there have been, perhaps, one or two instances where work has been stopped in the same way, but there are clear indications that the position has become better understood, and that in future the agreement will be carried out.

Apart from the great usefulness they have attained in the settlement of disputes, one has been impressed with the great educative value of these reference boards on employer and employee alike, a result that is bound to ensue when men sit down with a sincere desire to achieve a fair settlement and thereby gain not only greater knowledge of one another's difficulties but increased mutual respect.

The Year's Operations

The cessation of hostilities has not brought about any immediate relief to the gold mines so far as war costs are concerned. At each successive annual meeting of the Chamber since the outbreak of the war, I have set out briefly the burden of costs borne by the industry as compared with pre-war conditions. The year 1918 has shown a marked increase in that burden, which at a moderate estimate amounts to not less than £6,000,000 per annum, made up as follows:

Increased cost of mining supplies	£4,000,000
Increased gold realization charges	400,000
War bonus and increases in wages	1,000,000
Allowances to employees on active service	200,000
War levy	400,000
Total	£6,000,000

The effect of these increases on the prosperity of the industry was also more marked in 1918 than in any

previous year. The dividends declared by the Witwatersrand Gold Mines in 1918 amounted to only £5,144,077, compared with £8,073,436 in 1914. Analyzing the dividends declared as between the Far East Rand mines and the remainder of the Witwatersrand, the heavy fall in dividends becomes still more evident. In 1914, of the total dividends declared, £8,073,436, the sum of £6,357,933 was by mines other than those of the Far East Rand. In 1918, those same mines declared dividends of only £1,929,430—a hopelessly inadequate return on the capital invested in them.

The working profits have decreased from £11,553,697 in 1914 to £7,500,270 in 1918, and from 9s. to 6s. per ton. Working costs have increased from 17s. 1d. in 1914 to 21s. 7d. in 1918, and the total costs from £21,943,692 in 1914 to £26,848,547 in 1918. It is true that this increase in working costs (most of which are expended on the Witwatersrand), coupled with the distribution of war expenditure on supplies, separation allowances, and other charges, has resulted in the unprecedented prosperity of the community, and we have certainly thus expended in working costs an additional sum of at least fifteen millions sterling during the period of the war, assuming equal tonnages treated. It is, however, a short-sighted view which considers that the elimination of a reasonable profit to the shareholder by the distribution of that profit in costs is really a satisfactory position, more especially when it is remembered that in many cases the continuation of operations by the mines has been possible only by a policy of extracting the richer ore in too large a proportion, thus shortening the lives of the mines, and, in the long run, the life of the community. The output for the Transvaal, at £35,768,688, unfortunately shows a further reduction of over two and a half millions compared with the previous year.

Our efforts to obtain some relief from the Union and Imperial governments have been, so far, unsuccessful. The report of the Gold Production Committee appointed by the Imperial government was, to say the least of it, disappointing from our point of view, and might fairly be thought to indicate a distinct want of appreciation on the part of the committee of the peculiar difficulties and disabilities of the gold-mining industry of the empire. Although the continuance of the gold mines at full pressure was urged, and undoubtedly was of the greatest importance during the war, no relief of the heavy burdens peculiar to the industry will apparently be granted.

It is difficult to bring home to the public that gold mining, far from being an exceedingly lucrative industry, associated apparently in the minds of many people with huge fortunes, is an industry extraordinarily unfavorably situated at a time of rising prices, and therefore an industry which, if its energetic continuance is desired, must be specially fostered and encouraged at such periods.

Canadian Mining Institute

The British Columbia branch of the Canadian Mining Institute is being reorganized by H. Mortimer-Lamb, secretary-treasurer of the Institute, who is making a tour of the province. It is proposed that the existing single provincial organization be divided into four distinct branches, representative of Vancouver Island and district, Victoria and district, Nelson and district, and Prince Rupert and district. Each will be charged with responsibility in connection with the promotion of the best interests of the mining industry within the limits of its territory.

Attention also is being given the matter of the annual Institute meetings, which hitherto have taken place in Eastern Canada. As it has been difficult for many Western members to make the transcontinental trip for a meeting of two or three days, it is proposed that there shall be an annual meeting in the West.

Trail Smeltery Ore Charges

The management of the Consolidated Mining and Smelting Co. has issued a circular under date of Apr. 23, 1919, announcing a reduction of ore treatment rates at the Trail Smeltery. It reads as follows:

To Lead Ore Shippers:

Schedule B, lead-ore rates, provides for adjustment of the base rate up or down on the increase or decrease in the prices of coke or labor as follows:

On the price of coke, 25% of the increase or decrease per ton.

On the price of labor per shift, 1½c. per ton for each 1c. charge per shift.

The last adjustment was an increase effective Aug. 1, 1918, as outlined in our circular of Aug. 27, 1918, which amounted to 80c. per ton.

The price of coke has advanced since then 40c. per ton, which indicates an increase of 10c. per ton of ore.

The price of labor has decreased since then .3646c. per shift, which indicates a decrease of .55c. per ton of ore.

The prevailing base rate of $8.30 per ton will be reduced, effective Apr. 15, 1919, 45c. per ton, or from $8.30 to $7.85 per ton of ore.

Since the beginning of the year 54 mines have shipped ore to the Trail Smeltery. The total number of tons of ore shipped for the period is 117,964. During the week ending Apr. 21 last, a total of 7420 tons was shipped to the plant. Following are the shipments from the various districts for the year to date: Boundary district, 22,832 tons; East Kootenay, 111,120; Nelson and Salmo, 446; Rossland, 38,825; Slocan and Ainsworth, $366; American Mines, 186, and miscellaneous, 113.

Oil Development in New Guinea

As the discovery of oil in commercial quantities in Papua would be of considerable advantage to British naval and mercantile interests, negotiations have been proceeding between the commonwealth and Imperial governments for expediting the development of the oil fields on a mutual basis. The Minister for Home and Territories recently announced that a satisfactory arrangement had been reached whereby each government will contribute £50,000 for testing areas where oil is believed to exist. British experts are to visit Australia and Papua.

French Imports of Spelter, according to the *Ironmonger*, amounted to 2416 metric tons in January, 1919, compared with 1433 metric tons in January, 1918, and 3408 metric tons in January, 1917. Zinc ore imported in January of 1919, 1918, and 1917 amounted to 4989, 2640, and 2519 metric tons, respectively.

Correspondence and Discussion

The "Big Bend" Situation

The Mexican situation is at present attracting general public attention; but there is one phase which has received only an occasional half column in the local papers and does not seem to reach the deeper news channels. I refer to the "Big Bend" border situation.

The "Big Bend" is the elbow formed by the Rio Grande River. It is part of the boundary between the United States and Mexico, is about 60 miles east of El Paso, Tex., and extends to within approximately 60 miles west of Del Rio, Tex. It is covered on the American side by the counties of Presidio and Brewster, and on the Mexican side by the states of Chihuahua and Coahuila. The boundary line here lies from 30 to 100 miles south of the Southern Pacific R.R. This railroad is the dividing line that separates this country from the rest of civilization. Once one leaves the railroad going south, he is in the wilderness and cut off from the outside world, and until he once more gets in contact with this artery of civilization he is out of touch with the world. These conditions lend themselves propitiously to the creation of the existing situation.

It is here that some of the ammunition (contraband) sold to the Mexicans is sent across the line. It is here that the Mexicans bring their stolen silver bullion and other loot to exchange for money, or—what they much prefer—clothes, ammunition, and food. Do not understand from this that the American Government is not cognizant of these conditions; it is, and is patrolling this bit of boarder, in a most efficient manner, with United States cavalry; but there are several hundred miles of this frontier. It is very rough; it is barren and arid, and long distances intervene between watering places. Also, it is unsettled and largely unfenced. Nevertheless, the vigilance of the American soldiers has materially lessened this traffic. The Mexicans resent this and retaliate by making raids to gather horses and cattle from the United States side, and, when opportunity offers or necessity drives, to kill and rob the lone ranchman or traveler.

Twice within the last six weeks such raids have occurred, and here is the interesting part: As soon as they were discovered by the Americans—and this was within a few hours after the raid occurred—a punitive expedition was dispatched to recover the loot. The marauders were found, and on both occasions a skirmish ensued in which several bandits were killed (fortunately no Americans were hurt), and after the smoke cleared away the stolen stock was recovered and returned. Another interesting fact is that one of the raids was, according to common report, headed by a Villista leader and the other by a Carranzista colonel.

Within the last six weeks an armed force has made incursions into Mexico in quest of outlaws, and on both occasions some of the raiders were killed. Far be it from me to decry or criticise these actions. I think that they are necessary under the existing circumstances, but it is too bad that these conditions exist. I have mentioned only two of these occurrences, but the outlawry has been going on for the last three years.

Existing conditions are to be attributed to the fact that the lawless element of Mexico has been passing backward and forward across the border ever since the Mexican trouble started, and the marauders have been, little by little, practicing their bad habits on the United States side of the line. In their own country all is fish that comes to their net; no person or property is exempt from their depredations, if they are able to despoil the victims and escape with the loot. At first they found that they could use the same tactics on this side. When they discovered a good horse or an unprotected individual they took the former or robbed and sometimes killed the latter. And all factions on the Mexican side are apparently equally guilty, both Villista and Carranzista adherents—the opportunity is all that they required.

So far as I can see, there is only one way to stop this, and that is to strike at the root of the trouble and restore law and order in Mexico. As it is, it is only the lawless ones that cause this trouble, but it is equally the fact that all parties bearing arms at this time in Mexico are lawless.

Twelve years ago I was in this same vicinity on the Mexican side of the line, and my person and property were as safe as they would be in any part of the United States. Today, were I to cross the line I would be extremely lucky if I were not killed within 24 hours after crossing the border. Z. Z.

El Paso, Tex., Apr. 26, 1919.

Occurrence of Gold in Sulphide Ore

In the *Journal* for Nov. 24, 1917, in the article on "Solving the Ore-Treatment Problem at the White Caps Mine," by John G. Kirchen, reference is made to the occurrence of the gold in the sulphide ores from that mine. As recorded in that article the conclusions reached regarding the occurrence of the gold were as follows: (1) The gold is not in a free state; (2) the gold is not in the form of a telluride; (3) the gold is possibly in the form of a manganese compound.

Work was undertaken in 1917 at the Mackay School of Mines to determine, if possible, how the gold does occur in this ore. It was necessary to discontinue the investigations of the problem before all the tests were completed, owing to the war work assumed by the metallurgy department. The following tests were run on high-grade ore from the White Caps mine. This ore assayed $275 in gold and ½ oz. silver to the ton. The ore had a pronounced cellular structure and consisted chiefly of the minerals quartz and calcite. The ore also contained smaller amounts of pyrite, stibnite, and realgar. Small bunches of stibnite crystals found in the vugs seem to indicate that this mineral was one of the last to be deposited. A black mineral, probably stibnite, also coats some of the pyrite and quartz.

After crushing the ore to pass a 115-mesh Tyler sieve,

panning does not reveal free gold, noticeable under microscopic examination. Gold has, however, been obtained by several tests, which tends to prove that it does occur in the metallic state, very finely divided and coated by the sulphide minerals. These tests will be briefly described:

In the first test a small sample of minus 115-mesh ore was carefully panned. It was noted that a black scum first formed, and this was removed for a special test. No sharp line could be drawn between concentrates and tailing, and therefore the last of the material remaining in the pan was considered as concentrates. After treating the concentrate, very fine particles of gold were noted under the microscope. The scum proved to be mostly sulphide minerals; and after a treatment with nitric acid small particles of gold were noted under the microscope. In both instances the gold observed was so fine that it would pass a 200-mesh Tyler sieve.

In the second test about 10 gm. of material was removed from a specimen piece with a hammer. This material was fairly coarse, and, without further crushing, was panned. No free gold was noted. The material was then treated with nitric acid to remove any possible coating on the gold; and, on microscopic examination, several very fine particles of gold were observed. These particles were all under 0.033 mm. in their largest dimension. They were all free from any gangue minerals. The test seems to indicate the occurrence of the gold in either the vugs or in the sulphides and shows that it is coated with some mineral which obscures its identification in the untreated ore.

A third test was then run to ascertain what proportion of the gold could be dissolved by aqua regia in the fairly fine ore. A sample crushed to pass a 115-mesh sieve, and assaying 13.36 oz. of gold, was used in the test. After treatment with aqua regia the residue assayed 0.10 oz. of gold. A fourth test was run to ascertain whether or not caustic soda would remove the coating on the gold. A sample was placed in a bottle with a strong caustic-soda solution and a few glass rods to act as a grinding medium. After rolling, the material was panned and a few particles of gold were noted.

A fifth test was run with the object of amalgamating some of the gold if possible. A small sample was ground for several hours in an agate mortar with a little water, caustic soda, and mercury. After correcting for possible gold in the mercury used, it was found that 6% of the gold in the original sample had been amalgamated. A test run for a shorter time without any caustic soda indicated only traces of gold amalgamated. Specimens of ore polished and etched with nitric acid have shown what appear to be small particles and thin flakes of gold occurring in the vugs in the ore. Careful tests for tellurium and selenium were made on the ore and also on the flue-dust from the roasting furnaces, but no definite reactions for either element were obtained. Analyses for manganese in the ore indicated only 0.016% manganese.

No tests were made on this ore to ascertain the possibilities of dissolving the gold in the original ore by means of cyanide solution, but as this point was mentioned in the article to which reference has been made, it might be of interest to note the result of tests which were conducted on sulphide ore from the Dexter White Caps mine in the same district. The ore from the two properties is similar in general appearance and mineralogical composition. I found that with fairly strong solutions 33% of the gold could be dissolved on treating the raw ore, but the consumption of cyanide was prohibitive, being as high as 28 lb. per ton of ore treated. I also found that, with very weak solutions, as high as 52% of the gold could be dissolved, with a consumption of cyanide of 6.6 lb. of potassium cyanide per ton of ore.

As the result of these tests I conclude (1) that the gold in the sulphide ore occurs as native or metallic gold and is not in the form of a compound; (2), that it is extremely finely divided and is coated with some black mineral, probably a sulphide of antimony; (3) that failure to observe the gold under ordinary examinations, and also the circumstance that relatively little gold is found after careful examinations, is due to the facts (as brought out in the tests) that the gold is coated and is so fine as to make its recovery or detection extremely difficult without a most careful microscopic examination.

WALTER S. PALMER.
University of Nevada, Reno, Nev., Apr. 15, 1919.

The Lyons Fair

The fourth annual fair at Lyons has been consistently and persistently advertised, and has been designed to replace the German fairs, which were so successful up to the beginning of the war.

The Lyons fair consists of a multitude of little booths filling all the public squares and parks. The booths are 15 ft. square, and are set in long rows. It is necessary to go up and down several steps in going from one booth to another.

One thinks of a fair as intended to attract visitors, and it is therefore something of a shock to see signs on many doors reading as follows: "The public is respectfully informed that this exhibit is open only to engineers, chemists, and plant managers." Another says, "Only those in a position to buy an expensive automobile are invited to inspect our exhibit."

A pretentious "exclusive representative" of American industries has catalogues of 61 manufacturers, arranged on shelves; and not a single catalogue is in French! The Canadian exhibit is well arranged and includes an interesting collection of minerals. Much business has resulted, but of course cannot be completed under present importation restrictions.

By far the largest part of the fair covers soap and perfume, toilet articles, and similar items. Only one American auto, the Overland, is in the section devoted to these machines, where there are 50 French machines. Paint is noted for its absence; and in view of the present deplorable appearance of the structures in France, that country should offer a wonderful field for paint manufacturers. It is true that much of the building is of stone and brick, but all the remainder requires freshening. I had hoped to see the silk exhibits, but the same secrecy (or, rather, conservatism) prevails, and admission to the Hotel de Ville, which is devoted exclusively to silk, is granted only upon presentation of a pass.

Probably by this time next year shipping conditions will be so improved that it will be worth while for American exhibitors to be represented here, particularly as it is proposed to build a series of suitable fair buildings. Hotel accommodations are utterly inadequate, and many visitors are unable to make satisfactory arrangements. Such accommodations as are available are unsatisfactory and expensive. All of this will, no doubt, be remedied next year.

MARK R. LAMB.
Lyons, France, Mar. 15, 1919.

Details of Practical Mining

A portable thawer equipment offers a means of relief from some of the conditions that are met at mines where extreme cold prevails. The uses for such a device in the mining field are many, and in addition to the suggestions made it will be found that a thawer can be employed in many other ways.

The method of lowering dynamite into blast holes described in a following article may be more adaptable to quarry practice, but contains the suggestion that may be a pertinent one for open-pit operations where dynamite is used in deep holes. The manner of holding the dynamite stick and the device for subsequently accomplishing its release are both effective. The device might be safer, as suggested, if made of wood, but the same durability cannot be expected as would result if the holder is made of iron, or, better still, of copper or some ductile metal.

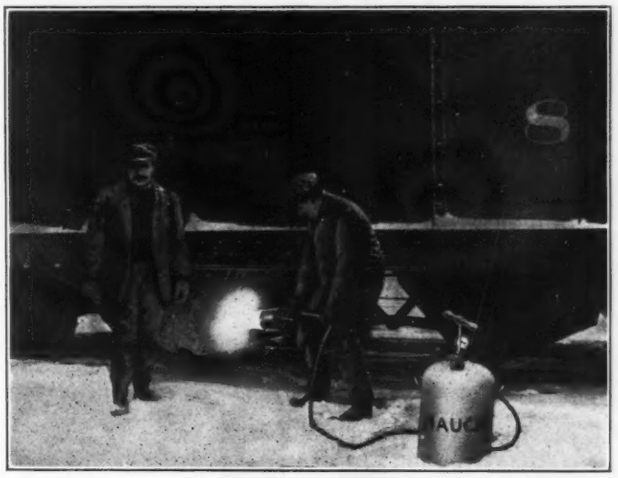
The slight expense connected with the installation described in the article "Ventilation for Prospects" makes it possible for the small operator to afford proper air circulation through his prospect shaft, and so not only add to the comfort and safety of the men but, in addition, to increase their efficiency.

Use of Thawers at Mines

In stripping or open-cut operations, when the work is carried on during the winter season, annoyance is often caused by freezing, which extends in a greater or less degree to all branches of the work. The exposed nature and the extent of territory usually covered by operations do not permit of much relief from this condition, and even though the work is continued through the day and night shift, the delays caused by freezing of equipment consume considerable time, and the total loss from this source mounts to a formidable figure at the end of a season's work.

Flooding of tracks and switches, causing accumulations of ice, and the freezing of overburden, ore, or coal in cars, are some of the inconveniences incident to winter operations at open-pit mines. A number of methods of overcoming the difficulties are now available, but most of these are unsatisfactory and, at best, expensive. Among them are applications of hot salt solution, removal of the ice with picks and brooms, and the building of small fires.

The Hauck Manufacturing Co., 101 to 113 Eleventh St., Brooklyn, N. Y., has placed on the market the Hauk thawer, the use of which offers a successful substitute for all of the above-mentioned methods. In addition, the thawer may be used to good advantage in the thawing of overburden previous to drilling and blasting, trenching, and in other instances where a quick, continuous heat is required. The thawer is furnished with either a compressed-air type of burner or one of the hand-pump type. The flame is always under the perfect control of the operator, and the burner is built to withstand the hardest kind of service and severe weather conditions.



METHOD OF THAWING COAL CAR

Delays from freezing are likewise frequent, in underground mines, although not to such a degree as in surface operations. A downcast shaft, however, draws in considerable cold air, which is always noticeable directly in the shaft and for some distance in the vicinity of shaft stations. Owing to this cause, ice in and around shafts is not uncommon, and frequently it creates a condition which not only inconveniences operations but is dangerous as well. The Hauk thawer offers possibilities as a device for ice and snow removal about shafts.

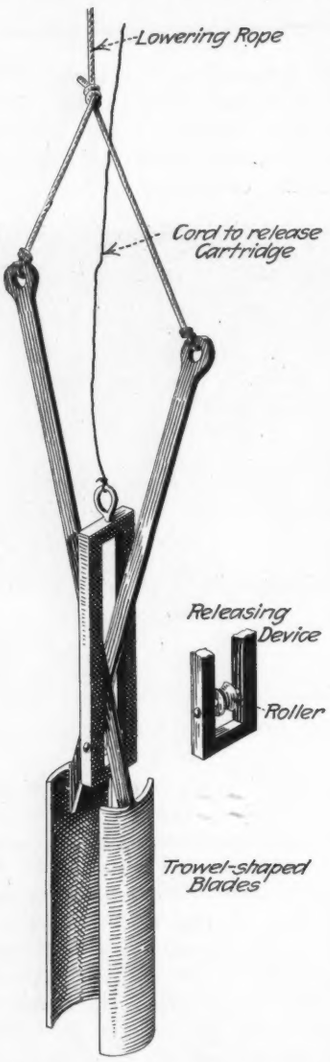
Lowering Dynamite Into Blast Holes*

The sketch on page 926 shows a holder device for lowering dynamite into blast holes which obviates the practice of dropping the sticks, as is frequently done in instances where the holes are of considerable depth.

The holder consists of a pair of tongs with the blades trowel-shaped to fit the cartridge. A rope which branches in a V to the upper end of each handle holds the jaws shut and prevents the cartridge from falling out. A second cord is employed to release the cartridge. It is attached to the upper end of a bar with a slot, through which passes the intersection of the jaws at their pivot. This slot allows the bar to slide upward when the cord is pulled. At the lower end of the slot is a roller which ascends in the inverted V formed at the pivot and spreads the jaws of the holder, releasing the cartridge. An improvement which might be suggested for this device would be to make it of hard wood rather than of

*Abstracted from Technical Paper 111, U. S. Bureau of Mines.

iron. There are two dangers surrounding the use of a metal instrument. First, nitroglycerin may get around the pin where the jaws work against each other, and so cause an explosion by friction. Second, lowering of sticks repeatedly into the same hole may result in small



HOLDER FOR LOWERING DYNAMITE INTO BLAST HOLES

bits of dynamite being rubbed off on the walls of the hole or small particles remaining on the jaws of the instrument, and these may be struck between the iron and the rock surface in hauling the device from the hole.

Ventilation for Prospects

BY CHARLES E. DUTTON*

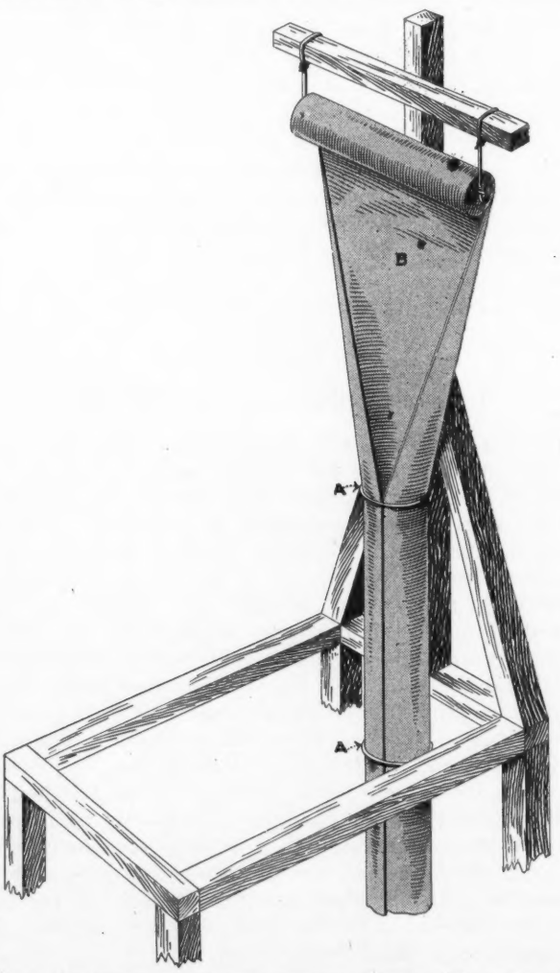
In recent years there have been deaths from gas in metal mines in which men have been employed in old workings. In the cases coming to my notice from Butte, Goldfield, and Arizona, the accidents could probably have been avoided by the taking of proper precaution. Since carbide lamps have come into extensive use, metal miners have become prone to forget the candle's warning. A shaft that has been closed for any length of time should be swept out with fresh air before being entered.

*Goldfield, Nevada.

Often shafts and other workings in isolated districts have poor natural ventilation. When a prospector or engineer shows up to look such a prospect over, his investigation must generally be limited until he can clear out the bad air. Usually he does not care to go to undue expense, or waste much time in doing this.

Under such circumstances, a home-made cloth air-pipe will be found useful. A bolt of cotton cloth, which can be found at any camp having a store; a needle, a spool of linen thread, some baling wire and a pair of pliers are all that is needed to make the device, which is shown in position in a shaft in the accompanying illustration.

In the sketch, the section from the upper ring *A* to the bolt *B*, hung on the cross-piece, acts as a sail and will catch any breeze from three directions. In case the wind comes from the rear, the bolt should be turned around. If sinking is in progress, the pipe may be lengthened in a few moments by sewing up another five-foot length, inserting another ring, and readjusting the bolt overhead. If the shaft is in a ravine, and no breeze is moving, or if the device is used in a winze, a blacksmith-forge blower can be connected to force



CLOTH AIR-PIPE USED FOR VENTILATING OLD PROSPECT SHAFTS AND SIMILAR WORKINGS

air below. If used in a tunnel from the portal, it can be hung from the roof or side wall. In fact, it will be found a useful accessory to any prospect. When no longer needed, the pipe may be rolled up on the bolt, and held ready for another emergency.

Industrial News from Washington

BY PAUL WOOTON, SPECIAL CORRESPONDENT

War-Minerals Relief Hearings

St. Louis has been added to the places already selected for hearings before the War-Minerals Relief Commission. This action was taken to make it more convenient for some claimants residing in Arkansas. The initial hearing will be held in St. Louis, beginning at 10 a.m. on June 10. The next hearing will be at Little Rock, and from there the commission will visit the other points previously designated for hearings, and which already have been announced. The commission is calling particular attention to the fact that all claims must be filed in Washington on June 2, if they are to receive consideration.

A number of hearings will be conducted in Washington before the commission leaves. On May 13, the commission heard the presentation of the claim of Henry B. Maxwell, of Hampton, Tenn., who has made claim for $10,000. A further hearing on the claim of the Chestatee Pyrites and Chemical Co. was conducted May 14 and 15. Owing to the fact that the report of the Government's mill engineer is not ready, a further hearing will be held May 28. The Oneida Mines Corporation, of Duluth, which has a manganese claim for $231,363, presented evidence to the commission on May 16. Audley H. Stow, of Bluefield, W. Va., who has a manganese claim for $25,647, was heard May 17. The National Pyrites and Chemical Corporation, of Pyriton, Ga., has been promised a hearing in Washington in the first week of June. The National Refractories Co. has been given the choice of a hearing in California, during the trip of the commission, or in Washington after its return.

During the seven-day period ended May 15, the larger demands received were filed by the following claimants: Porter, Allen, Nesbit and Nance, Radium, Colo.; Payne and Thomas, Nederland, Colo.; Whitehorse mine, Philipsburg, Mont.; Leavell and Curtis, El Paso; Butte and Plutus Mining Co., Butte; Pillsbury, Crowder, and Kay, Chico, Calif.; Eugene Stevens, Boulder, Colo.; J. J. Appel, Philipsburg, Mont.; J. H. Cook, Batesville, Ark.; Logan Rives, Batesville, Ark.; Gallagher and Grasselly, Peoria Flat, Calif; E. B. Clark, Seattle; C. E. Groce, Blythe, California.

War Materials Sales

During the week ended May 9, the sales of surplus war materials amounted to $77,901,960.18, a large figure as compared to the amount realized from the sales of the preceding week, which was approximately $1,500,000. The larger part of the figure represents sales made through the Ordnance Department, which reported a sales total of $45,883,995.74 for the week, over half of which was realized from the disposal of ammonium nitrate, of which the Government had a large quantity and which was made surplus to the War Department when munition manufacturing ceased.

It is planned to convert the ammonium nitrate into dynamite, and the Department of Agriculture has purchased a large quantity for $10,320,000, which, when converted into dynamite, will be used in clearing land for agricultural purposes, and will also be extensively used in the building of better roads. Large quantities were also sold to the Allied Nitrate Commission and the Importers' Association, which, it is planned, will be used for similar purposes in foreign countries. The Ordnance Department also sold $15,000,000 worth of copper.

Nitrate Importations

The War Trade Board announced on May 19 that on and after July 1, 1919, nitrate of soda and nitrate of potash may be imported into the United States without restriction under a general import license when coming from countries with which general trade is authorized.

Importers are advised that any shipments of nitrate of soda or nitrate of potash which arrive prior to July 1, 1919, will not be released for entry until such date, except under individual import licenses as now required, and that such licenses will be issued only in accordance with the present rules and regulations governing the importation of these commodities.

The Iron and Steel Industry During the First Four Months of 1919

The iron and steel industry, for the first four months of 1919, comprising the production and marketing of iron ore, pig iron, and steel, has, on the whole, shown little change in volume, as compared with the corresponding period of 1918, according to E. F. Burchard, of the U. S. Geological Survey. Considering that in 1918 the nation was involved in a war the end of which could not be foreseen, that the demand for iron and steel products for war purposes was at its height, and that in 1919 war orders were suspended and construction activities for the most part held in abeyance awaiting price adjustments to follow the declaration of peace, the showing of early 1919 seems favorable indeed, and should foreshadow increased activity as soon as open market conditions become better established. In the meantime, however, a further slowing up is to be expected.

LAKE SUPERIOR IRON ORE

In the Lake Superior iron-ore districts the stocks of ore at the mines Jan. 1, 1919, were about 23% less than those of one year earlier, and on the Lake Erie docks they were about 10% less. The navigation season having opened earlier in 1919 than in 1918, it has been possible to ship down the Lakes a greater tonnage of iron ore thus far in the present season, so that a total of approximately 1,412,000 gross tons was moved to Apr. 30, compared with 236,000 tons at the corresponding date in 1918. This has restored the balance of ore on the docks at the Lake Erie ports, so that there is no danger of shortage. Better railway facilities in the spring of 1919 have made it possible to forward 4,266,000 tons of iron ore from the Lake Erie ports to inland blast furnaces up to Apr. 30, 1919, compared with 2,642,000 tons to Apr. 30, 1918.

Prices of the standard grades of iron ore from the Lake Superior districts, delivered at Lake Erie ports, have been reduced 20c. a ton, on account of a cut of 20c. per ton in the vessel carrying charge. This represents a reduction of 3 to 3.5% in cost to the consumer at Lake Erie ports. The iron mines are reported to be in good condition to produce a large season's output, but the demand for ore on Apr. 30 was comparatively light.

Daily Pig-Iron Production Declines

In the first four months of 1919 a total of 11,811,000 gross tons of pig iron was made, compared with 11,232,000 tons in the corresponding period of 1918. The daily average production of pig iron, by months, has shown a steady decline from 106,500 tons in January to 82,600 tons in April, 1919, and the number of furnaces in blast in January was 350, compared with 212 at the end of April. The downward curve of daily average production in the first four months of 1919 is just the reverse of that in January to April, 1918. With so many blast furnaces idle, the curve may show a still further depression before the next upward swing. Prices of pig iron on Apr. 30, 1919, were $7.25 per ton lower than in October, 1918, and $4.25 lower than on Jan. 1, 1919. These prices represent reductions of about 20% and 12% respectively.

Steel

The production of steel ingots from Jan. 1, 1919, to Mar. 31, 1919—later figures are not available—was approximately 8,475,000 gross tons, compared with 7,588,000 tons in the corresponding period of 1918, an increase of nearly 12%. Prices of 4-in. steel billets on Apr. 29 were quoted at $38.50 per ton, compared with $43.50 Jan. 1, 1919, and $47.50 on Nov. 11, 1918. The unfilled orders of the United States Steel Corporation on Mar. 31, 1919, amounted to 5,430,572 gross tons, compared with 9,056,404 tons on the corresponding date 1918, a decrease of about 40 per cent.

Surplus Iron and Steel Stocks

Plans for the disposition of surplus stocks of iron and steel in possession of the War Department were arranged at a series of conferences held between representatives of the Director of Sales and committees representing the American Board of Scrap-Iron Dealers and the steel industries of the United States.

The meetings were called so that the Government might obtain the views of the leading representatives of the steel industry, in order that their ideas might be utilized in formulating a policy for the disposal of the Government's surplus iron and steel. Government representatives emphasized the statement that they wanted to sell in such a way as to affect industry least and at the same time realize the maximum return for the Government.

It was the consensus of opinion of the meetings that all steel and steel scrap material should be disposed of by means of sealed proposals, to be accompanied by a certified check for 20% of the amount of the bid made, which amount would be applied against the last shipment, intermediate shipments being made with sight-draft bill of lading. This method, in their opinion, would be productive of the best results to the Government, and was eminently fair to all bidders. As a result of a discussion as to whether or not sales should be made "on ground" or "f.o.b. cars," the latter arrangement was determined upon as the best for the Government to follow, for, by so doing, more bids would be secured and at more favorable prices. An out-of-town bidder would not know how much it would cost to place the material on cars, and without such information would not be in a position to make an intelligent bid.

The totals of not only scrap, but of semi-finished and finished material, as well, were shown, and it was conceded that the entire quantity was much smaller than had been anticipated. For the purpose of comparison it was reported that the country consumed in 1916 about 12,000,000 tons of purchased scrap, so the present surplus of approximately 605,000 tons would represent only a small percentage of the 1916 consumption.

Removal of Import Restrictions Upon Emery

The War Trade Board announces that all existing restrictions upon the importation of emery and emery ore have been removed, effective May 13, 1919, and that shipments of such commodities may hereafter be entered under General Import License PBF-37, described in W.T.B.R. 726, issued May 8, 1919.

Shipments of emery and emery ore now in the United States, entered under import licenses which were issued upon the condition that such emery or emery ore would not be used for consumption until a period of 60 days had elapsed from the date upon which the restrictions against the importation of emery and emery ore were removed, are released for immediate use, and such condition need not be further observed by the holders of such licenses.

Tariff Revision

Although Republican leaders are practically agreed that the extra session of Congress is not the opportune time to attempt general tariff revision, they are ready to urge the safeguarding of such industries as were not highly developed in this country before the war, but which have assumed important proportions since foreign supplies were restricted. The Democrats do not expect to oppose bona fide protection of this character. The best example of this class of industry is that engaged in the manufacture of dyestuffs and other coal-tar products.

It is admitted that a tariff alone will not afford practicable protection to the dyestuffs industry, and efforts are being made to devise a licensing system to augment the tariff. Administrative difficulties are great in the carrying out of licensing, and there is grave doubt as to whether any satisfactory plan can be evolved. If a practicable plan should be devised, it would apply to other commodities as well, it is believed. Strenuous efforts are to be made, for instance, to preserve the potash and magnesite industries which have been developed in this country during the war.

Consolidation of Bureaus

The War Trade Board announces that, effective May 12, 1919, the Bureau of War Trade Intelligence has been merged into the Bureau of Enemy Trade. Such work of the Bureau of War Trade Intelligence as is still being carried on will be conducted in the future by the Bureau of Enemy Trade.

Bureau of Mines To Dedicate New Buildings

The Bureau of Mines, Department of the Interior, during the week of Sept. 29, 1919, will formally dedicate its new million-dollar laboratories and workshops in Pittsburgh, Penn., at which time Government officials, together with the governors of the principal mining states and the leaders in the mining industries and miners' organizations, will be present to take part in the dedicatory ceremonies.

One feature of the dedication will be a great, national "safety-first" meet, which will be participated in by teams of miners from various sections of the country. There will be contests in mine rescue work and in first aid to the injured, and, as there is considerable rivalry among the teams of the different mining companies, it is expected that these competitions will require at least two days for decision. On Sept. 30 the elimination contests will begin at Forbes Baseball Field at Pittsburgh, and will continue until only the winning teams are left for the final championship contests, which will take place on Oct. 1, immediately after the elimination trials are completed. It is hoped that the coal operators in the Pittsburgh districts, employing thousands of men, will declare a holiday on the day of the final contests. At the last national "safety-first" meet, which was held in 1911, more than 18,000 miners were present. The contests are to be open to all teams from the mining and metallurgical industries of the United States.

Other events of importance will make the dedication an occasion for a notable gathering of engineers and scientific men. The different laboratories of the Bureau have been completely equipped for the investigation of various problems relating to increased efficiency in the mining and metallurgical industries. Visitors will be invited to the electrical and mechanical workshops and laboratories of the Bureau and also to the petroleum, gas, and coal laboratories, the testing gallery of the mine safety section, and the industrial gas-mask division.

Another point of interest will be the experimental mine of the Bureau at Bruceton, Penn., 12 miles from Pittsburgh, where an actual explosion of coal dust in the mine will be staged for the benefit of those attending. The dedication will cover three days, Sept. 29 and 30, and Oct. 1.

Bureau of Mines Chiefs in Salt Lake City

SALT LAKE CITY CORRESPONDENCE

A gathering of the chiefs of the various substations of the U. S. Bureau of Mines in the Western states was held in Salt Lake City May 7, to meet Dorsey A. Lyon, of the Bureau at Washington, who has been in this city inspecting the work of the local station and making visits to smelting plants and mining properties in this section. The object of the meeting was a discussion of means to further better coöperation between the Bureau and mine operators. In a speech, Dr. Lyon pointed out that the Bureau holds the same relation to mining as the Bureau of Agriculture to farming.

The report of work for April at the University of Utah station shows the month to have been an active one. New Cottrell treaters and electrical equipment were installed and found to be satisfactory. Small-scale tests on complex lead-zinc ores of the state gave such good results that further experiments will be made in the larger rotary kiln—maximum capacity 300 lb. per hour—and in Cottrell treaters. Muffle tests were made on complex ores from Utah and surrounding states; also tests on pure silver minerals in a small-scale rotary electric furnace.

Work on the lower-grade alunite from the southern part of the state was continued; also on ore-dressing and roasting problems, done in coöperation with several mining companies. Work on concentration and flotation tests for quicksilver ores was begun. Tests of oil shales were made at a local plant, indicating that satisfactory results may be obtained; also, investigations concerning the smoke problem of Salt Lake City.

Edward L. Dufourcq

Edward L. Dufourcq, whose tragic death in Mexico was recently reported in the *Journal*, was a member of the class of '90 at Columbia, Arts, and of '92, School of Mines. He practiced mining engineering from the time of his graduation, his chief interests being in Mexico. He was a member of the Delta Kappa Epsilon and Tau Beta Pi fraternities. Mr. Dufourcq contributed the section on "Gold Amalgamation and Cyanidation" for the

EDWARD L. DUFOURCQ

"Mining Engineers' Handbook," published about a year ago and edited by Prof. Robert Peele. He was a member of the American Institute of Mining Engineers, Mining and Metallurgical Society of America, and the American Museum of Natural History (to which he had given some rare mineral specimens), and was assistant general manager of the Teziutlan Copper Co. in Pueblo, Mexico, and president of Las Minas Pedrazinni, Arispe, Sonora, Mexico.

On Dec. 1, 1918, Mr. Dufourcq left for Mexico, to go to the mines at Teziutlan. On Apr. 15 of this year, a little after 6 p.m., he was riding with the mine superintendent from the town of Teziutlan to the mine, travelling on a gasoline motor car used on the railroad, when both were shot by bandits. The superintendent and Mr. Dufourcq were wounded, the latter falling from the train. Both were taken by the bandits. The superintendent was finally released. He requested that Mr. Dufourcq be released, but was informed that he would

not be given up till morning. At 3:30 a.m. on Apr. 16 Mr. Dufourcq died of wounds. At about 9 a.m the next day his body was found, robbed of all belongings.

The body was shipped from Mexico, and a funeral service was held at Christ Church, Broadway at 71st St., New York.

Return of Minnesota Iron Range Members of the 27th Engineers

A "welcome-home" dinner, held at the Hibbing Public Library, Hibbing, Minn., was given to returning Minnesota iron range members of the 27th Engineers on May 8, by Oscar B. Warren, general manager of the Meriden Iron Co. Three of the men comprising the Minnesota contingent are employees of the Meriden company. The roster comprised: Company A—John Edwin, Nashwauk; Clifford Nichols, Hibbing; Odin Rudstrom, Chisholm. Company B—Herman Adams, Aurora; Richard O. Hocking, Hibbing. Company C—Fred Flink, Nashwauk; Frank Kline, Eveleth; Howard Rutherford and Jacob A. Stampe, Hibbing; Ray Segog, Duluth; O. C. Torvund, Ely. Company D—Kenneth Gregory, Keewatin; Joseph Sorby, Chisholm. Headquarters Company—Frank Manley, Hibbing. The menu follows:

ASSEMBLY ROLL CALL

MENU

ZERO HOUR 7:30 P.M.

ROLLING BARRAGE
à la Memories

From 40 Hommes
8 Chevaux.

No interference from
M. P.'s or R. T. O.'s.

You all know which trip?

OVER THE TOP FRUIT COCKTAIL
Heavenly Hash
FIRST WAVE SOUP

HAND GRENADES SHRAPNEL

MACHINE GUN BULLETS
DELAYED THANKSGIVING TURKEY

RIGHT dressing FRONT gravy

FRENCH ROLLS

AT EASE POTATOES CAULIFLOWER
à la Officers' Mess

DUDS
Mustard Gas Dressing
EMERGENCY RATIONS

PUMPKIN PIE
Just as Mother Bakes
S. A. COFFEE

CONCENTRATED PHOSGENE
SMOKE SCREEN PRODUCERS

——SURPRISE ATTACK——

GAS ALARMS
From All Members of the 27th
RECALL

In addition to those whose names appear on the roster, there were present B. W. Batchelder, general superintendent, International Harvester Co.; M. H. Barber, general superintendent, Cleveland-Cliffs Iron Co.; E. J. Maney, manager, Shenango Furnace Co.; F. P. Botsford, general superintendent, Pickands, Mather & Co.; D. E. Woodbridge, and O. B. Warren.

Most of the returned soldiers told of some of their experiences over seas, and the evening proved an interesting and instructive one. Mr. Warren and Mr. Woodbridge spoke briefly, and it was decided to hold another meeting at a later date for the purpose of forming a Minnesota Range Association of the 27th Engineers.

Canadian Industrial Commission

TORONTO CORRESPONDENCE

The members of the Industrial Relations Commission, who are making a survey of the dominion, have finished the sittings at Cobalt. There does not appear to be a wide gulf between the operators and the miners, the chief cause of dissatisfaction being the refusal of the mine managers to recognize the union, the reason being that the administrative head of the union is in a foreign country, and that it is an offspring of the Western Federation, which the managers refuse to recognize. The workers also spoke in favor of an 8-hr. day from collar to collar, and for an 8-hr. day for surface men, instead of nine hours. They also felt that as they were paying hospital dues they should have representation on the board. As Cobalt is the highest paid camp in eastern Canada, and as the prospects are that wages will be increased with the higher prices for silver, there is little cause for dissatisfaction. Drill runners are paid $4.75 an 8-hr. shift, with 25 to 50c. extra for sinking, and the other workers are paid in proportion. Only a few of the surface men come under the lowest rate, which is $3.75 a day.

Association of the 27th Engineers

A circular letter was issued to all former members of the Regiment under date of May 10, 1919. Numerous of these letters have been returned, owing to imperfect addresses. Any former member of the Regiment who has failed to receive this letter is requested to notify W. R. Ingalls, 115 Broadway, New York, who also desires to be kept informed of changes of addresses.

REPORT OF TREASURER
JAN. 1, 1919—APR. 30, 1919

Balance on hand Jan. 1 and subsequent receipts were as follows:

Balance on hand	$7582.49
Contributions reported in E. & M. J.	717.60
Interest on bank deposit	62.54
Membership dues	5.00
Proceeds from sale of wool	40.85
Loans to members of Regiment, repaid	75.00
Total	$8483.48

Disbursements were as follows:

Band instruments and music	$243.30
Assistance to men detained at Camp Merritt	565.00
Relief in cases of need	255.00
Loans to members of Regiment	75.00
Expended through Colonel Perry	451.62
Welcome home sign	8.00
Exchange on bank checks	1.24
Total	$1599.16

The balance on hand May 1, 1919, was $6884.32.

A commemorative medal has been made, one of which will be sent to each former member of the Regiment. These are now ready for distribution and will be mailed as soon as the roster can be checked for the correction of defective addresses. A history of the Regiment is being prepared, and as soon as published a copy will be mailed to each former member. After these expenses have been paid there will remain in the treasury a substantial sum. Following a conference with the Advisory Committee it was decided to husband this fund for the assistance of former members of the Regiment who find themselves in real need. W. R. INGALLS,
Treasurer.

Ralph S. Edmondson, vice-president of the Abrasive Iron Co., with a plant at Harrison, N. J., and main office in New York, lost his footing and fell under the wheels May 16 when trying to board a Jersey Central train at the main station in Elizabeth. Both his legs were crushed, necessitating amputation in the Elizabeth General Hospital.

Mr. Edmondson was 1st lieutenant in Company A, 27th Engineers, throughout the campaign in France, and during part of the time was commanding officer of the company. His feet have been amputated just above the ankles. He is resting comfortably in the hospital, and it is expected that he will be able to return to business.

Editorials

Congress in Extra Session

CONGRESS convened in extraordinary session on May 19. More than the usual number of urgent questions are to come before this Congress, of which the most important are the ratification of the peace treaty and action on the creation of the League of Nations. Many matters which vitally affect the welfare of the nation await decision. The fate of the railroads and the telegraph and telephone lines must be settled. The shipping problem, national prohibition, the woman's suffrage amendment, a peace-time naval and military policy, the revision of the war-revenue law, the institution of a budget system, the welfare of discharged soldiers, laws to suppress the spread of Bolshevism, repeal of the war powers granted to the President, restriction of immigration for a period of years, revision of the naturalization laws and the deportation of alien undesirables are some of the weighty problems that press for solution. Among the questions of interest to the mining industry, and which may reach a hearing and possible settlement at this session, are the oil- and mineral-land leasing bill, and tariff and labor legislation.

The American Mining Congress plans to ask for a permanent upbuilding of a few war essentials in a National Resource Bill, which will include only substances not profitably produced except by Federal aid, protective or otherwise. It is also the purpose of this organization to draft legislation aimed to modify the drastic provisions of the Sherman Anti-Trust Law and to create a Federal commission through which combinations not in restraint of trade may be legalized and placed under Government control.

Across the Atlantic

LOVE of adventure sends men away from their firesides to the four quarters of the earth. Soldier, sailor, pioneer, and miner are alike impelled by this force. Whether it is the storming of a trench, the chase of a submarine, the clearing of virgin land or mushing through the far stretches of northern Alaska in search of the elusive placer, there will always be men who are willing to take the chance, and not for the money that is in it but out of the pure joy of novel accomplishment and through desire for new things and the passion to escape the humdrum of ordinary pursuits. Roosevelt hunted big game in Africa; Cecil Rhodes opened up a vast land, and history is replete with stories of men who have overstepped the superficial boundaries of ordinary existence and have accomplished what they wanted to do.

Not many years ago the crossing of the Atlantic upon wings would have seemed a dream. It has actually been accomplished. Men of our Navy have coolly calculated the undertaking in a manner similar to the solution of any engineering problem. Distance, weather conditions, plane construction, communication, control instruments, flight details, and the insurance of the maximum opportunity of rescue in case of mechanical difficulties were all figured to a hair. The thing was done. The accomplishment is a triumph to the man who sits at his desk and figures out his problem, and, with confidence in his calculations, is courageous enough to act. More than that, the success of the men of the Navy is an inspiration to every engineer. All honor to the men who did the trick, from the humblest worker in the shop to the lucky fellows who crossed the Atlantic!

Trade Relationships

IN A RECENT address to the Sixth National Foreign Trade Convention at Chicago on Apr. 24, Eugene Mayer, Jr., after making a plea for a "live-and-let-live policy," said:

"But a certain caution in international trade relationship is still imperative. Even if we now join a concert of nations for the purpose of preventing war and for the settlement of international disputes, we may not safely assume a complete fruition of our every hope. I think every country will be justified in endeavoring to assure its economic integration to the greatest extent that is possible. The war has taught us the value of certain key industries. We should demand the preservation of those industries, and should endeavor to secure the supplies and materials necessary for their maintenance, and we should be equally willing to contemplate other countries doing the same thing."

It will take time for the lessons of this war to sink in, and we should keep these lessons before us, lest in the midst of diverse discussion we overlook them. It is wisdom to make our country as nearly a self-contained unit as possible. The base of such a structure is founded upon the availability of raw products. We have the technical skill. We have finances. We can build manufacturing establishments. The need for the development of a national policy having for its objective the encouragement of those industries which are in a position to insure the supply of basic raw materials is of vital moment.

The Treatment of Bolshevism

FROM some of the numerous outpourings on the subject of Bolshevism we cull the following paragraphs:

"The aim of the Bolsheviki is communism and equality for everybody. We may find out eventually that Bolshevism is not the proper means for attaining our end. We will then act accordingly and somehow reach communism by opportunism, but always work toward communism.

"We believe that ultimately everything must be socialized. Everything must belong to the state, and no one must own anything. A person may have anything he wants simply by asking for it. That is our Utopia, which we may not reach for a long time, of course."

There is a delightful vagueness about all this, as well as a singular disregard for sound reasoning. A perspective based upon history and an understanding of sociology and economics is the best corrective for loose

thought. At present the hold that Bolshevism has attained is due largely to the ignorance of the individual, who is swayed by the thought that, just beyond, there is some unusual fulfillment of human desires, obtainable not by the ordinary route of hard work and good living, but by some short-cut that is devoid of effort and sweet in taste. Each of us cherishes illusions of one kind or another, but Bolshevism, communism, or any other "ism" of like kind is a delusion of a vicious nature. That it will ultimately work itself out, in those countries where it appears to have secured a foothold, just as a plague runs its course, goes without saying. In the meantime, it is best handled in a manner similar to that called for in the treatment of a malignant disease—by quarantine of those affected by it.

Thrift and Investment Protection

DURING the period of the war all countries, particularly those engaged in hostilities, having been in need of an excessive amount of money to finance their activities, conducted campaigns of saving. The campaigns met with remarkable success, as witnessed by the number of small investors in government securities and the growth of deposits in the savings banks.

The education that produced these results was needed perhaps more in the United States than in other countries, for here thrift had previously been a matter of no special public interest. Remarkable as the results have been, it is probable that the necessity and the practice have not prevailed long enough to become a habit in those to whom the idea was novel, and, unless spurred on or assisted, many will let their savings go and soon be back to the old hand-to-mouth existence, with no thought for the morrow.

Aside from the personal benefits derived from saving, which are really a national concern, our Government will be in need of large amounts of money for many years to some. This money must be derived from taxes, and the taxes will be derived largely from incomes. It is therefore imperative that the Government do all that it may to encourage further saving, and, what is still more important, it should protect, as far as possible, those who have saved.

The British government is fully alive to the situation and is continuing its control of new capital issues. The Investment Bankers' Association of America has made a survey of the situation and is strongly in favor of publicity, supervision of new issues, and the oversight of promises made by venders of securities.

In this connection there are in the statutes of many Western states the so-called "blue-sky" laws, which are intended to protect the investors of those states against fraudulent promotions by domestic and foreign corporations. These laws have to do with speculative investments. They require that vendors make a full statement of the affairs of the companies whose securities they offer for sale. If the representations meet with the requirements of the laws and the approval of officials, a statement is made to the effect that, so far as the state officials have been able to determine, the business is legitimate. In Montana and Arizona the requirements preceding approval go a little further. In these states the commission must be satisfied that "in its judgment the project promises a fair return on stocks, bonds, or other securities by it offered for sale."

There is a limited amount of protection in these laws, but they still come far from giving that full protection that is desirable, and the old saying that "a fool and his money are soon parted" still holds good to some extent in spite of them. Mails cannot be censored except as to actual falsehoods. It is the half-truths, insinuations, comparisons, that are perhaps more effective in drawing out savings than are misrepresentations. It is this class of advertisements and "news letters" passing through the mails that do a damage which the "blue-sky" laws cannot prevent.

Many of those who have been active in the framing of "blue-sky" laws have had in mind making absolutely safe all investments in publicly issued stocks, which were not to be sold unless they were sound investments. It is almost impossible to attain such a standard. Many types of business are speculative and always will be. The stocks of mining, manufacturing, lumbering, agricultural, and many other companies come within this class. Such business is necessary to the welfare of the nation, and should be curbed only where fraud is evident, or where those solicited cannot afford to take the risk involved. Nor can it be regarded a wise provision that the question as to whether the business appears to be one "promising a fair return on the stock" be left to a commission. Such a provision should scarcely be exercised except by one who is a specialist in the business under consideration.

Perhaps it would be well to follow the British plan, which makes sure that the investor has in his possession, or can secure, all necessary authentic information in respect to the investment, and then leaves it to him to decide how risky or safe the business may be. Before Congress adjourned Secretary Glass asked for national legislation in this direction, but the matter went no further.

The British system, operating under the Companies' Act of 1907 and subsequent amendments, requires the issuance of a prospectus, or submission of information equivalent to that which should be found in a prospectus. The act applies to associations of more than 20 persons. The prospectus must be signed by the directors or proposed directors. It must contain the memorandum of association, and data concerning the location of office and properties, purposes, and share capital and to whom it has been so far issued; the kinds of shares and to whom each has been issued and for what consideration; remuneration of directors, their names and addresses; number of shares to be subscribed before any are allotted, and provides that none are to be allotted until that number has been subscribed. Previous stock transactions must be mentioned. In addition, there are included the names and addresses of persons who have sold and intend to sell property or good will to the company, together with details as to what consideration was paid to them. Commissions, preliminary expenses, and promoters are all carefully covered; also the interest of directors in the promotion, and their compensation. The auditors must be named, and specific statements made as to voting rights of the shareholders. The directors or those who sign the prospectus are legally responsbile for any losses incurred by purchasers through misstatements or misrepresentations.

The aim of the British practice is to secure all information possible, to make those who furnish it legally responsible for its accuracy, and then to make it accessible to those who are asked to buy shares. If the in-

telligence of the purchaser is not sufficient to enable him to protect himself with this information in hand, the government gives him up as hopeless.

This manner of extending protection places no burdensome restraint upon legitimate adventures. It has the merit of reaching all those whom the "blue-sky" laws of the United States endeavor to protect, but, further than this, it places clearly before all of the public the inside workings of questionable enterprises. It is to be hoped the present Congress, with its many important duties, may find sufficient time to devote to national "blue-sky" legislation.

In the present readjustment it is well to remember the young professional man. Lawyers, doctors, engineers, and others surrendered their immediate prospects and served the flag in whatever capacity the opportunity offered. They are now returning to take up their professions where they can. The older men, who in the majority of cases have resources, can bridge over the period of reëstablishment without material discomfort, but it is different with the younger man. He is particularly in need of encouragement. It is up to the capitalist, the company, the corporation, and other employers to give more than ordinary consideration to his claims.

When the price of silver was released from its cage it soared buoyantly upward. For a while it looked as if silver at $1.29 per ounce would again become a reality; and may be so; although at present the price has dropped to $1.10 and appears to be steady at that figure. The immediate outlook is good for a continuance of the higher price. This means prosperity to the silver miner. Undoubtedly there will be greater opportunities for the employment of more miners in the silver-producing districts, and this will serve to take, in part at least, the surplus of miners from the copper and zinc mines. Some of the older silver camps will probably resume, resulting in the prospect of a widening market for mining machinery, supplies, and labor.

BY THE WAY

"Do'st thee see that there gert 'ugeous rock 'anging up there, m'son?" said Cap'n Dick. "W'y, dam-me, I've thought a good few times if 'twere to burst forth she'd scat us to shivers, an', dam-me, I naws bloody well that thee an' me'd rather be sittin' 'ere 'avin' a bit of a tell an' pullin' away on tha Peerless than 'ave singin' to tha 'ouse an' not 'ear un. An' all o' this 'ere starts me thinkin' 'long lines o' this 'ere Safety First. Back long we, feyther—an' min' you, m'son, 'e 'ad no use for these 'ere quiet go-by-tha-groun' chaps—'e'd say that wo't wuz h'everybody's business wuz nobody's business. and w'en there wuz sumthin' to be done, bes' bloody thing is to do it thysel'. But mos' of us, m'son, is w'ot tha rector, w'en 'e preaches, calls passive. I naws bloody well 'alf tha men in tha mine o've seen this 'ere boulder 'ave figgered on pullen daown, or blastin' h'out or sumthin', but, dam-me, they thinks as 'ow that job's h'up to someone h'else; so there she stays till one o' these days daown she'll come all by 'erself. W'ot's say, m'son, if we blast un naow?"

D. E. A. C.

Noon came, and we were collected in the super's office as usual, and it was the electrician's time to tell a story. "Did you boys ever hear," he began, "of how I made the King of Siam pay me the salary he owed me?" "The King of Siam?" we exclaimed, incredulously. "Yes, the King of Siam, and this is a true story I am telling you," he insisted. "Tell away," we cried, indicating that we would believe it if it was as true as he said it was. "It was back in '95. I was a youngster then, and, having just got out of electrical school, thought I knew 'juice' from amperes to watts and from Franklin to Edison. I got a job erecting plants with a company that manufactured those old Brush arc machines, the only kind of lighting much in use then. I used to travel around the country, setting them up and breaking in the stationary engineers to run them. One day an order for a complete lighting outfit, including engine, generator, and all, came from the King of Siam, who had decided to have a few modern improvements in his palace. The boss asked me if I wanted to go over with the outfit, and I said 'sure,' and over I went. I had a bunch of natives for helpers and not a real mechanic in the crowd. I had a devil of a time building a boiler house, setting up the machine, and wiring the grounds and palace for those old-fashioned arc lights. I got a great reputation for being a wonderful man, though, and the Siamese women were all crazy about me, and they were some pippins, too. It was a great night, when for the first time the King and his subjects saw an electric light, and they cheered me like mad. The King right away offered me the job of Chief Electrician of Siam, and, not knowing any better, and being in love with one of the Queen's maids, I accepted the nomination. I was to have $500 a month, real money, in my new job, but nothing showed up at the end of the first month, and I was too polite to say anything, and worked right along at the job for another month. Still no salary; so with $1000 due me, more than I had ever had in my life before, I felt that the dignity of my position demanded an explanation. The King was most cordial, and finally I made out the interpreter's talk to the effect that my not getting any salary was an oversight that would be corrected at once, so I backed out and returned to the power house to dream about what I would do with all that cash. The next day I expected to see the King's Treasurer sure, but nothing stirring, so I got sore and hatched up a little scheme to get my money. That night at 8 as usual I started up the machine and switched on the lights, and everything was lovely and lively around the palace. At 8:10 I pulled the switch and closed the throttle, and things were livelier still in the palace. Pretty soon the King's Chief Messenger came running to the power house with a torch and said some Siamese talk to this effect: 'His Majesty sends to you his most gracious respects, and why is there no light?' 'Return them respects to His Grace,' says I, 'and inform him that there will be lights again when I get my salary.' Well, sir, in ten minutes the King's Treasurer was at the power house with my money, and the lights and the merry night life of the palace went cheerily on. The Queen's maid had began to look a little dark to me, though, so in a few days I finished breaking in a native electrician and left them to work out their own salvation. It was great fun while it lasted," he finished.

"We believe you!" we exclaimed, as the admonitory 1 o'clock whistle blew.

Personals

A. H. Toenges, formerly of Flat River, is now at Washington, Missouri.

Arthur Thacher has returned to St. Louis after a trip to New York and Boston.

Edwin J. Collins, of Duluth, is examining some copper properties in the Ray district, Arizona.

William C. Davis recently examined the Church-Union mine, in El Dorado County, California.

Clarke Sullivan and **W. T. Lundy** have opened engineering offices in the Mills Bldg., in San Francisco.

George W. Marks has gone to Mohave County, Ariz., to develop a new silver prospect for St. Louis interests.

James F. McCarthy, of Wallace, Idaho, president and manager of the Hecla Mining Co., is in San Francisco.

Samuel Shapiro, mining engineer, 53 West 113th St., New York, has left for Georgia to examine a gold property.

Ollie F. Ludtke, recently returned from service, is now at Lucerne, Wyo., as geologist for the Vinegar Hill Zinc Company.

Mark R. Lamb was in southern Illinois investigating modern coal mining and tipple equipment in the interest of French clients.

George L. Shook has been appointed superintendent of the Port Henry, N. Y., blast furnace of Witherbee, Sherman & Co.

A. P. Watt, consulting mining engineer to the Bureau of Mines, is in Washington in reference to the war-mineral relief claims.

W. J. Olcott, president of the Oliver Iron Mining Co., has returned to Duluth, from an extended vacation in Florida and Carolina.

Capt. W. H. Comins has returned from the front and is again in charge of the National Lead mine at Flat River, Missouri.

P. S. Haury, of San Francisco, has received the appointment of mill superintendent for the Blair Mines Co. at Silver Peak, Nevada.

H. A. Wheeler has returned to St. Louis from the North Texas oil fields, where he has been examining oil properties for St. Louis clients.

A. H. Burroughs, Jr., has become associated, as mining engineer, with Maj. H. H. Armstead, and is now on his way to Talache, Idaho.

E. E. Hunner, general manager of the Hanna Ore Mining Co., has returned to Duluth from a meeting of company officials held in Cleveland.

H. K. Sherry, formerly general superintendent of the Wisconsin Zinc Co., is with the Canadian Johns-Manville Co., stationed at Asbestos, Quebec.

W. C. Jackson, J. M. Callow, and **John H. Watson,** of Salt Lake City, have been making mill tests at Clifton, Ariz., for the Arizona Copper Co., Limited.

Frank A. Kennedy, mining engineer, Duluth, Minn., and associates have taken over a group of silver-copper properties in the Seven Devils district, Idaho.

George L. Collord, general manager of the operations of the Shenango Furnace Co., and **F. A. Demms,** auditor, inspected the Minnesota mines of the company on May 14.

G. Chester Brown has been appointed chief mine inspector of California, being promoted from the position of first deputy inspector, which he has held continuously since 1915.

George P. Pilling, formerly blast-furnace superintendent of the Northern Iron Co., has been appointed manager of the Philadelphia office of Freyn, Brassert & Co., engineers, Peoples Gas Bldg., Chicago.

Ray St. Germaine, formerly assistant general superintendent of the Vinegar Hill Zinc Co., in the Wisconsin district, is now located at Tulsa, Okla., where he will manage the oil properties of the Vinegar Hill Company.

Charles McKinnis, of Wallace, Idaho, manager of the National Copper Mining Co. has gone to Ranger, Tex., where he has secured an oil lease and is preparing to sink a well.

G. E. Stowell, of the Oregon Bureau of Mines and Geology, is at the Northwest Station of the U. S. Bureau of Mines, where he is just completing a series of flotation tests on the refractory gold-silver antimony ores from the Ben Harrison mine, Whitney, Baker County, Oregon.

Ralph Arnold, who has been working on oil problems in the U. S. Bureau of Internal Revenue, has given notice of his intention to resign within the next few weeks, as he wishes to return to private practice.

S. L. Rawlings, general manager, and **C. V. Drew,** mining engineer, of the Cerro de Pasco Copper Corporation, were expected to arrive in New York about May 22 after an extended visit to the company's properties in Peru.

Louis D. Huntoon, secretary of the Mining and Metallurgical Society of America, and **F. Kingsbury Bull,** Pawtucket, R. I., were late visitors to Ray, Arizona., in connection with exploration work on the Ray-Broken Hill property.

Heath M. Robinson, formerly a member of the U. S. Geological Survey, has recently resigned from that organization and is now employed by F. Julius Fohs, consulting oil geologist, with headquarters at 60 Broadway, New York City.

Lieut. R. J. Goodwin has recently been discharged from the infantry and is now metallurgist for the Florida Mountain Mines Co. This company is treating the stope fillings of the old Trade Dollar Mine, at Silver City, Idaho.

L. C. Graton, who before the war was professor of mining geology in Harvard University, will take charge of the copper division of the Industrial Unit of the U. S. Bureau of Internal Revenue on June 1, and begin to organize his working force.

A. H. Richards has been made superintendent of the copper smeltery at Garfield, Utah. Before becoming assistant superintendent at Garfield, he for several years held a similar position at A. S. & R. lead smeltery at Murray, Utah.

Frank Cameron, special investigator for the Bureau of Mines, who has been in France and Alsace, is expected to arrive in New York about May 26 to make a confidential report to Van. H. Manning, director of the Bureau, on the foreign potash situation.

William Frazier, superintendent of the Davis-Daly Copper Co., is seriously ill. **Maxwell Atwater,** general manager of the same company, is convalescing at the Mayo Brothers' hospital at Rochester, Minn., and is expected to be able to return to Butte within two weeks.

James Johnston, has resigned as mill manager, Nipissing Mining Co., Ltd., Cobalt, Ontario, with which company he has been for the last eight and one-half years. He has gone to England, and will engage in consulting work with **Charles Bibbers,** with offices at 120 Bishopsgate, London.

C. Roy Olson, formerly mill superintendent for the Pittsburg-Dolores Mining Co., Yerington, Nev.; the Brady flotation plant, Round Mountain, Nev.; and manager Tonopah Liberty Mining Co., has accepted the position of mill superintedent for the Como Consolidated Mines Co., Como, Nevada.

Hugh M. Wolfiin has resigned the position of chief mine inspector of California to accept the position of superintendent of safety in the State Industrial Accident Commission, of which the mines division is a part. Mr. Wolfiin was appointed chief inspector upon the organization of the commission in 1914.

Tom M. Owens, general mill superintendent of the Federal Mining and Smelting Co., Wallace, Idaho, who was reported as returning to Australia, his home, in the last issue of the "Journal," will again assume his former position with the Federal company after investigating the latest developments in the flotation process in Australia.

F. Cushing Moore, who has been associated with Clarence Cunningham as consulting engineer at the Hewitt and Van Roi Mines, Silverton, B. C., has severed his connection with the Cunningham interests and has left for Spokane, Wash. **L. F. Fogle,** former mill superintendent for the Consolidated Interstate-Callahan company, in the Coeur d'Alenes, recently took charge of the Hewitt and Van Roi mills.

Capt. Edward Steidle has recently returned from Europe after 16 months' service, during which he was in the fight at St. Mihiel and for the last few months of the war was within the 10-mile zone. He was wounded twice, received the Croix de Guerre and has been cited for the D. S. O. Captain Steidle was originally attached to the 30th Engineers and later placed in command of the First Battalion of the 1st Gas Regiment. He was formerly with the Bureau of Mines as mining engineer in charge of the Utah and Nevada districts.

Obituary

John Biscomb, 46 years a resident of the Michigan copper country, died recently at his home at Isle Royale mine. He held mining captain positions at Old Dominion in Arizona; Tecumseh, now part of the La Salle; and Wyandot. He was 77 years old and was born in Cornwall.

A. J. Sharwood, well known in mining circles on the Rand, where he served under John Hays Hammond and afterward joined Messrs. G. & L. Albu as manager in Johannesburg of the General Mining and Finance Corporation, died in England recently after an operation. Mr. Sharwood was also connected with the British Aluminum Co. He abandoned his active mining connection about nine years ago, residing in England until his death.

Societies

American Institute of Electrical Engineers, Denver Section, held its annual meeting on May 17. The lecture of the evening was delivered by Albert C. Crehore, whose subject was "Progress in Atomic Theory."

Society of Chemical Industry, New York Section, held a meeting on May 23, when papers were presented on "The Chemists and the Brass Industry," by W. B. Price; "Shipping Containers," by Charles P. Beistle; "Liners for Shipping Containers," by B. Arkell; and "Paper Barrels and the Like," by A. H. Searle. An informal dinner was held before the meeting.

Teknik Club, of Denver, held its last dinner meeting of the season, on May 13, at the Shirley Hotel. A. B. Scott presented a paper on "The Gold Situation," and J. E. Conley described the manufacture of smokeless powder for naval guns. Following a discussion of the papers presented, officers were elected for the ensuing year. H. B. Lowden was reëlected secretary-treasurer. Fifty-two members were present.

Montreal Metallurgical Association was organized in 1915 to secure greater efficiency in connection with the manufacture of munitions and has now decided to continue on a permanent basis. It has a membership of 245. At a recent meeting the following officers were elected: President, G. P. Cole; vice-president, H. J. Roast; secretary, Capt. J. G. Ross; members of council, W. K. Gillespie, J. D. Paxton, E. M. Seale, G. R. Kendall, J. Haynes, E. C. Kirkpatrick, W. G. Dauncey, F. G. Gardner, B. A. McFarlane and T. R. Davidson.

Canadian Mining Institute, Ottawa Branch, held a meeting on May 9 to reorganize the local branch of the Institute, which was suspended during the war. Thirty members of the Canadian Mining Institute resident in Ottawa were present. The following officers were elected: Chairman, W. A. Carlyle, manager of the British America Nickel Corporation, secretary, H. H. Claudet, resident manager of the General Engineering Co.; executive committee, A. W. G. Wilson, J. C. Murray, and L. D. Burling. Maj. Geo. C. Riley, of the Soldiers' Civil Reëstablishment Department, urged the need of providing employment for the professional and technical men returning from overseas. He stated that in two days the department had received applications from over 120 men of this type who were absolutely without work, but it had only been able to place 15 or 16 of them. A number of suggestions as to the best way of meeting the difficulty were made. In the course of a general discussion much emphasis was placed on the necessity of securing adequate remuneration for the professional and technical men in the government service.

Industrial News

International Motor Company announced an increase in the April sales of the Mack truck, 45% of which were of the heavy-duty type.

The United Filters Corporation, 65 Broadway, New York, has announced the appointment as manager of its Chicago office of C. B. Oliver, who has been identified with the company for several years. Mr. Oliver has been engaged for a number of years in solving filtration problems. The

location of this office will still be in the Peoples Gas Building.

The Macomber & Whyte Rope Co., manufacturer of wire rope and wire at Kenosha, Wis., announces the opening of its New York Branch at 30 Church St., telephone Cortlandt 7436, under the management of E. E. Robirds, who has been with the company for 10 years, having been manager of the Pittsburgh and Chicago offices.

Walter A. Zelnicker Supply Company, in St. Louis, has just appointed F. X. Meehan as advertising manager. Mr. Meehan has been associated, in various executive capacities, with Fairbanks Morse & Co.; A. T. & S. F. R.R. Co. coast lines; and St. Louis Smelting and Refining Works of the National Lead Co. He was an active Four Minute Man during the war.

Westinghouse Electric and Manufacturing Co. announces the promotion of A. E. Hitchner to the position of manager of the mining section of the industrial sales department, with headquarters at East Pittsburgh, Penn. Mr. Hitchner was formerly with the Baldwin Locomotive Works and three years with the Link-Belt Co. on construction work. In 1912 he was sales representative for the Westinghouse company in the anthracite coal fields and in charge of the Wilkes-Barre office. In his new position Mr. Hitchner will handle the sale of all apparatus made by the Westinghouse company for use in the mining industry.

Chamber of Commerce of the United States announces that Homer L. Ferguson, president and general manager of the Newport News Shipbuilding and Dry Dock Co., of Newport News, Va., has been elected president as the result of a mail vote of the organization's board of directors. Mr. Ferguson succeeds Harry A. Wheeler, of Chicago, who declined reëlection. In addition to Mr. Ferguson, the following other officers were elected by the board: Vice-presidents: Eastern District, A. C. Bedford, New York; North Central, Joseph H. Defrees, Chicago; South Central, Thomas F. Gailor, Bishop of Tennessee; Western District (to be filled later). An executive committee was also elected in addition to the foregoing officers.

The French American Banking Corporation has leased the ground floor at 65 William St., New York City, and will open for business there about June 1. The corporation is an alliance of the National Bank of Commerce in New York, the First National Bank of Boston, and the Comptoir National d'Escompte de Paris, formed to foster trade between France and the United States. It was incorporated at Albany, N. Y., Apr. 29. It is capitalized at $2,000,000, with a surplus of $500,000, all paid in. The officers of the corporation are Maurice Silvester, president; Roger P. Kavanagh, vice-president and treasurer; John E. Rovensky, vice-president; F. Abbott Goodhue, vice-president, and Thomas E. Green, secretary.

American Blower Co. has announced that James Inglis, president, sailed from New York on May 15 as a member of a commission appointed to confer with European cotton interests on post-war conditions in the cotton industry throughout the world, with special reference to the proposed world cotton conference to be held in New Orleans next October. While connected with the War Industries Board, Mr. Inglis was chairman of a joint committee made up of several governmental departments whose purpose was to secure better baling of cotton and less wasteful methods of handling the cotton crop. Mr. Inglis is continuing his connection with the work, being transferred to the Department of Commerce. Mr. Inglis will also visit Belfast, Ireland, to confer with his associate in the blower business, Mr. Davidson, of the Sirocco Engineering Works.

International High Speed Steel Co., Rockaway, N. J., has transferred the executive and main offices from 99 Nassau St., New York, to the works at Rockaway, N. J., and requests that all communications be mailed to that address. In order to facilitate deliveries in less than carload lots to customers in the Metropolitan district, a branch office has been opened at Nos. 294-296 Lafayette St., New York City, where a warehouse has been secured. An extensive and varied stock of tool, alloy and high-speed steel, and also of the "Bulldog" brand of mining and rock drill steel, both hollow and solid, in hexagon, octagon, quarter octagon, round, and cruciform sections, in all sizes from ⅜ in. to 2 in. diameter, will be carried. The New York office and warehouse will be under the management of John T. Mungovan. Telephones: Rockaway, 147; Spring, 2332-2333.

Trade Catalogs

"Sockets to Harmonize." Cutler-Hammer Mfg. Co., Milwaukee, Wis. Folder; two-color; 3½ x 6; 4 pp. which emphasizes the harmony to be secured through the use of C-H push-button porcelain sockets with white enamel fixtures. Also lists the pendent and fixture types of push-button porcelain sockets, and is intended for distribution by jobbers and dealers.

Pipe-Threading Machines. Walter A. Zelnicker Co., St. Louis, Mo. Folder No. 263, containing list of special offerings, including used portable, hand-power pipe-threading machines which have been thoroughly overhauled, and 1250 steel tray bodies for miscellaneous use around manufacturing plants, as storage bins, sorting trays, mixing pans, transfer bins, skips, and similar devices made for the U. S. Government but the orders for which were canceled at the end of the war. Also a list of lamps and copying presses.

Headlights for Mine Locomotives. Ohio Brass Co., Mansfield, Ohio. Bulletin No. 202A; 6 x 9; 12 pp; illustrated. Describes "Imperial Incandescent Headlight for Mining Locomotives." Type MH, 8-in. reflectors made with both cast-iron and brass casings, with spring suspension for absorbing shocks and keeping rays of light on the track. A strong, steady, unvarying beam under the hardest service is furnished. Dimensions, weights, tables of specifications, and lists of switch and fuse equipment are included.

Reilly Water Heater. Griscom-Russell Co., 90 West St., New York. Bulletin 320; 6 x 9; 16 pp.; illustrated. Describes heating of feed water for boilers, showing economy of fuel, increase of boiler capacity, increase of effective condenser capacity, saving in cost of boiler maintenance and increased life of boiler. The statement is made that fuel savings and increase of boiler capacity will vary from 8% to 15%, and, furthermore, in round numbers, 1% less coal is required and maximum boiler capacity is increased 1% for every 11° the feed water is heated before being delivered to the boilers. Instructions are given on how to compute the savings resulting from the use of a proper feed-water heater. The bulletin contains a general description of the Reilly types D and C of feed water heaters, with ample illustrations and specifications.

"Melting Metal With Electrically Heated Pots," Cutler-Hammer Co., of Milwaukee and New York. Folder, 6 pp.; 3½ x 6 in., illustrated. Calls attention to the advantages of electrically heated melting pots over gas and gasoline, on account of cleanliness, elimination of open flame, greater efficiency, and ease of control. C-H electrically heated metal melting pots are made to melt down and maintain at the proper temperature all soft materials, such as lead, tin, solder, and babbitt. They are limited to a maximum temperature of 550 deg. F., and are made in standard sizes up to 150 lb. metal capacity. Two types are described—the floor type in 10 and 25 lb., sizes, and the bench type in 50, 100, and 150 lb. sizes. Automatic temperature control equipment can be furnished, which consists of a dynamic thermometer and the control panel. The bulb of the thermometer is immersed in the metal and the coil is set to the temperature desired. The action is such that the metal is kept between a minimum and a maximum temperature. Prices, dimensions, and other descriptive matter are included.

New Patents

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 25c. each.

Converting—Muffled Ore-Converting Apparatus. Aron M. Beam, Denver, Colo., assignor to the American Continuous Retort Co., Denver, Colo. (U. S. No. 1,299,661; Apr. 8, 1919.)

Crushers—Frame for Jaw Crushers. William B. Easton, Chicago, Ill., and David Cole, El Paso, Tex. (U. S. No. 1,298,188; Mar. 25, 1919.)

Drills—Feeding Means for Drills. Lewis C. Bayles, Easton, Penn., assignor to Ingersoll-Rand Co., Jersey City, N. J. (U. S. No. 1,299,814; Apr. 8, 1919.)

Electric Furnace Apparatus—For Ores or Minerals. Ingenuin Hechenbleikner, Charlotte, N. C., assignor to Southern Electro-Chemical Co., New York, N. Y. (U. S. No. 1,299,336; Apr. 1, 1919.)

Electric Furnace. William K. Booth, Chicago, Ill., assignor to Booth-Hall Co., Chicago, Ill. (U. S. No. 1,299,110; Apr. 1, 1919.)

Explosive Cartridge. Montague H. Roberts, Jersey City, N. J., assignor to Air Reduction Co., Inc. (U. S. No. 1,298,097; Mar. 25, 1919.)

Flotation—Device for the Aeration and Emulsifying of Pulp for Flotation. Charles Taylor, Nogales, Ariz. (U. S. No. 1,299,059; Apr. 1, 1919.)

Fuel—Apparatus for Burning Powdered Fuel. Arthur S. Mann, deceased, Schenectady, N. Y., by Eleanor D. Mann, administratrix, assignor to General Electric Co. (U. S. No. 1,298,530; Mar. 25, 1919.)

Gold-Washing and Accumulating Device. Roy C. Sawyer and John W. West, Pasadena, Calif. (U. S. No. 1,298,577; Mar. 25, 1919.)

Ingot Molds—Apparatus for and Method of Teeming Ingot Molds. Emil Gathmann, Baltimore, Md. (U. S. Nos. 1,298,034 and 1,298,035; Mar. 25, 1919.)

Iron Oxide—Method for Reducing. Horace W. Lash, San Francisco, Calif. (U. S. No. 1,296,973; Mar. 11, 1919.)

Loading and Conveying Apparatus. Frank Billings, Cleveland, Ohio. (U. S. No. 1,300,-111; Apr. 8, 1919.)

Metal Briquet. Felix A. Vogel, New York, N. Y., assignor to General Briquetting Co., New York, N. Y. (U. S. No. 1,299,878; Apr. 8, 1919.)

Metal Oxides—Making metallic oxides. Theodore J. Vollkommer, Pittsburgh, Penn. (U. S. No. 1,300,522; Apr. 15, 1919.)

Mine Cars—Safety Stop for Mine Cars. Joseph Klansnic, Black Diamond, Wash. (U. S. No. 1,297,575; Mar. 18, 1919.)

Mine Tracks—Adjustable Clamp for Slide Rails in Mines. Henry Fread Heumann, Marissa, Ill. (U. S. No. 1,298,946; Apr. 1, 1919.)

Mining Machine. James A. Brantley, Sand Springs, Okla. (U. S. No. 1,299,905; Apr. 8, 1919.)

Molybdenum—Method of Extracting and Recovering Molybdenum from Its Ores and Concentrates. Henry Alfred Doerner, Denver, Colo. (U. S. No. 1,299,559-60; Apr. 8, 1919.)

Nickel Scrap and Sludge—Process for Treating. Woolsey McA. Johnson, Hartford, Conn. (U. S. No. 1,299,577; Apr. 8, 1919.)

Petroleum—Method for Refining Oil. Chauncey B. Forward, Urbana, Ohio. (U. S. No. 1,299,449; Apr. 8, 1919.)

Phosphate Rock—Method of Treating Gases. Ingenuin Hechenbleikner, Charlotte, N. C., assignor to Southern Electro-Chemical Co., New York, N. Y. (U. S. No. 1,299,337; Apr. 1, 1919.)

Potash—Method of Extracting Potash and the Like. Arthur Burton Andrews, Auburn, Me., assignor of one-half to himself and one-half to Herbert F. Kelley, Auburn, Me. (U. S. No. 1,296,035; Mar. 4, 1919.)

Potash—Process for Obtaining Water-Soluble Potash. William D. Richardson, Chicago, Ill. (U. S. No. 1,295,601; Feb. 25, 1919.)

Potassium Compounds—Apparatus for Recovering Potassium Compounds from Cement-Kiln Gases. Henry Blumenberg, Jr., Oro Grande, Calif. (U. S. No. 1,297,639; Mar. 18, 1919.)

Potassium Nitrate—Process of Making. Henry Blumenberg, Jr., Oro Grande, Calif., assignor to Chemical Construction Co., Los Angeles, Calif. (U. S. No. 1,297,640; Mar. 18, 1919.)

Potassium Salts—Apparatus and Processes for Recovering Potasium Salts from Cement-Kilns, Cement Mixtures, Waste Gases, etc. Henry Blumenberg, Jr., Oro Grande, Calif. (U. S. No. 1,296,462; 1,-296,463; 1,296,464; 1,296,465; 1,296,466; Mar. 4, 1919.)

Refining—Process for the Refining of Metals. Joseph B. Murray, Brooklyn, N. Y. (U. S. No. 1,295,568; Feb. 25, 1919.)

Refractory—Process of Making Furnace-Lining Materials. Albert P. Meyer, Pittsburgh, Penn., assignor to Allen S. Davison, Co., Pittsburgh, Penn. (U. S. No. 1,300,-631; Apr. 15, 1919.)

Roasting—Apparatus for Roasting or Drying Ores. Joseph Molnar, Goose Bill, Mont. (U. S. No. 1,296,834; Mar. 11, 1919.)

Separation—Ore-Separating Apparatus. George McElwain, El Paso, Tex. (U. S. No. 1,299,848; Apr. 8, 1919.)

Editorial Correspondence

BUTTE, MONT.—May 17

Miners' Phthisis will be the subject of extended study by the U. S. Bureau of Mines, according to Daniel Harrington, mining engineer in charge of safety work in the Rocky Mountain region for the Bureau. Incidental to this study will be a separate investigation as to remedial measures for the miner and underground worker in places where high temperatures prevail. This investigation is to be made largely by physicians from the public health service. Miners' consumption annually exacts a heavy toll in the Butte district, because of the prevalence of fine dust, which is inhaled and settles in the lungs, in time excluding the free passage of air throughout the lung cell, resulting in the development of tuberculosis.

SALT LAKE CITY, UTAH—May 16

Park City Mines Are Still Closed as the results of the recent strike, although the situation appears to be improving and the more conservative element among the miners is gaining ground. Miners in the Tintic section have asked for a raise in pay of 75c. a day and for an eight-hour day. Radicals have been at work here also, but in this camp there has been a greater disposition toward moderation. Mine owners have refused to meet committees in any way connected with the I.W.W. or kindred organizations, expressing themselves as preferring the alternative of a complete close down as at Park City. They state, however, that they are ready as individual managements to meet bona fide representatives of their own employees. The demands of the miners were formulated a little less than a week ago, and the camp is quiet, with work going on as usual. It is expected that conditions will settle soon.

Reduction of Freight Rates on Utah products is being sought, the mining and smelting interests joining in the effort and seeking to secure rates which would permit the removal of low-grade ores. Coal-mine operators and plaster and potash producers also are seeking relief. What is felt here to be unfair discrimination against Utah was brought by shippers to the attention of Max Thelen, Director of Public Service, U. S. Railroad Administration, at a meeting held May 7 in the offices of the traffic bureau. Freight reductions are said not to be likely in the immediate future, on account of high costs and lessened traffic after the war, but the director is stated not to be in favor of any increase at present.

WALLACE, IDAHO—May 17

Guggenheim Purchase Is Rumored of the Hercules, Tamarack & Custer and the Northport smeltery in a deal with the Day interests. The report now is that the deal was consummated several weeks ago when there was much publicity regarding the alleged negotiations. When the two mines resumed operations, after a suspension of four months, with no apparent change in control or management, it was assumed that the deal was off. Now the report is that it was in effect consummated, but that the actual transfer has not been made. Reliable information is, of course, unobtainable, but the fact that the Days closed down tight last Christmas when the market for lead began to crumble, remained closed four months, and then started up when the lead situation was even worse than when they closed down, is significant.

DULUTH, MINN.—May 17

Shipments of Iron Ore from the Lake Superior district for April were 1,412,239 tons, as compared with 235,870 tons during the same month last year. The favorable balance for 1919 is not an indication of conditions, but is entirely due to the earlier opening of navigation. Though the Steel Corporation is shipping at a normal rate, practically all independent operators are awaiting an improvement of the pig-iron market before starting shipments. Despite many curtailments and some complete shut-downs, the labor situation has remained good, and no marked unemployment has appeared, as the open pits have been able to absorb the larger proportion of labor released. Wages have remained unchanged. Shipments for April, 1919, and April, 1918, were:

Dock	April, 1918	April, 1919
C. & N. W., Escanaba	.....	36,701
C. M. & St. P., Escanaba	.....	34,716
D. S. S. & A., Marquette	5,222	.....
L. S. & I., Marquette	5,486	.....
C. & N. W., Ashland	.....	139,190
Soo Line, Ashland	.....	8,168
Great Northern, Superior	71,299	61,272
Soo Line, Superior	10,254	40,458
Northern Pacific, Superior	18,009	.....
D. M. & N., Duluth	56,991	794,050
D. & I. R., Two Harbors	68,609	297,684
Totals	235,870	1,412,239

IRONWOOD, MICH.—May 17

Michigan State Tax Commission held hearings in the iron mining counties during the week, at Bessemer May 13, at Crystal Falls May 14, at Iron Mountain May 15, and in Marquette County, May 16. Valuations were placed on all mines, but the figures may be revised before being placed on the assessment rolls. Total for Gogebic County is about 15% greater than for last year. In round numbers valuations for individual mines are as follows, ore in stockpiles being included:

Mine	1918	1919
Ashland	$51,000	$70,000
Norrie-Aurora Group	13,899,000	12,588,000
Newport	6,909,000	7,996,000
Bonnie	760,000	659,000
Davis	78,000	447,000
Geneva	.....	225,000
Royal	175,000	201,000
Puritan	3,094,000	3,464,000
Ironton	482,000	1,520,000
Yale	321,000	589,000
Colby	905,000	839,000
Palms	.....	2,351,000
Anvil	.....	412,000
Keweenaw	883,000	1,414,000
Mikado	144,000	130,000
Pilgrim	136,000	140,000
Plymouth	6,177,000	8,000,000
Wakefield	4,500,000	5,500,000
Sunday Lake	632,000	632,000
Brotherton	184,000	289,000
Castile	139,000	125,000
Morgan	40,000	90,000

The total for 1919 is over 49,000,000.

PHOENIX, ARIZ.—May 16

Assessment on Arizona mining property within the time of statehood has been raised more than ten times and in percentage of state assessment from 31.7 to 58.63 of the whole. In 1912 the new state's mining property had a valuation of $45,145,084; the following year there was the remarkable jump to $140,488,648; in 1918 the assessment, based largely upon profits and intangible valuations, was $491,679,957. The intangible value system of assessment now is under fire in suits in the State Supreme Court, filed by the Inspiration and American Smelting and Refining companies. The former was dismissed by the high court for lack of state prosecution, but has been reinstated, under protest. A late decision of the Federal Appellate Court in San Francisco, denying the State of Arizona the right to tax the Standard Oil Co. for profits made on the basis of a product within the State of California, may have some bearing on the question.

KINGMAN, ARIZ.—May 17

In the Apex Suits filed against each other by the United Eastern and Tom Reed companies there has been stipulation that the latter shall have right to continue its winze in the disputed ground to an intersection with the Big Jim raise of the former, and, in the event a fault be encountered, Tom Reed shall have the privilege of raising or sinking a reasonable distance along the fault plane to show any relation there may be between the vein and the fault, though not to drift along the fault.

JOPLIN, MO.—May 17

New $60,000 Magnetic Separation Roasting Plant is being erected at Galena, Kan., by the Joplin Separating Co. It is the same type of plant as was erected by this company 19 years ago, just after it had taken out the original patents. After installing plants in many different mining sections in the country, the company sold the patents and has since restricted itself to the operating end. The company operated a plant in Joplin until two years ago, when it was forced to close by the city council, objection having been made to the fumes. The new plant is to have several improvements, including oil firing. The greater portion of the ore used is not less than 8% iron, and about 20% metallic zinc. Only a limited amount of this quality of ore is produced in the district, and it is not believed that the plant, which will have a capacity of handling 65 tons of ore daily, can be kept busy. However, another company is planning the construction of a similar plant immediately, and it may mean a market for some of the lower grade of zinc-iron ores that heretofore have been unmerchantable. The iron that is made in the separating process is lost.

DALLAS, TEX.—May 16

Texas Oil Production for quarter ended Mar. 31 is valued at $30,000,000, according to Controller Henry B. Terrell. This is from six to eight million dollars greater than during the previous quarter. The increase is due partly to discovery of new wells, but also to the gathering of more complete records by several revenue collectors, provided for at the last regular session of the State Legislature. These collectors listed over 200 new companies. Number of oil producers now on record at the controller's office is about 800. The House passed a resolution, subject to the approval of the Senate, authorizing the Governor and State Prison Board to exercise the option held by the state on Blue Ridge farm, Fort Bend County, where the Gulf Production Co. made the recent discovery of oil.

Texas & Pacific R. R. is planning to build branch lines to gridiron the oil fields of Central West Texas, to handle the great increase in traffic which has resulted from the tremendous development in the Ranger district in such a short time. Preliminary surveys have been authorized in the territory lying north, south, and west of the immediate Ranger neighborhood. A party of railroad officials has made a tour of this section, its personnel including Harry Bonner, president Missouri Pacific R.R., also director of the Texas & Pacific; J. H. McClement, member executive committee, Missouri Pacific and director Texas & Pacific; Bertram Cutler, director Missouri Pacific and representative Rockefeller interests, from New York City; C. E. Ingersoll, director Missouri Pacific and Pennsylvania R.R. and president Midland Valley R.R., from Philadelphia; and John G. Lonsdale, president National Bank of Commerce, St. Louis, and director Missouri Pacific. The party was accompanied by J. L. Lancaster, regional director of the Southwestern group of railroads, and others.

TORONTO, ONT.—May 19

Reports of Extensive Oil Concessions in Alberta having been made or considered by the Canadian government, which created much uneasiness and dissatisfaction in Western Canada, were set at rest by the presentation to the Canadian Parliament on May 12 of the correspondence relating to the matter. The papers show that in July, 1917, an application was made on behalf of the "Shell" Transport Co., of London, England, for exclusive oil and natural gas rights for the period of the war and five years after, with free right of way, freedom from customs duties, and other special concessions. The offer was rejected, as were two subsequent applications in the same interest. A greatly modified proposition was then submitted, the "Shell" people, offering to enter upon the undertaking in coöperation with the government, the company to find the funds and to divide the net profits with the government on a 50% basis. The matter was under consideration by the government for some months, during which many strong protests against the proposal were made, and finally, on Mar. 28, Hon. Arthur Meighan, Minister of the Interior, sent a communication to the representative of the company declining to entertain the scheme.

The Mining News

ALASKA

KENNECOTT (Kennecott)—Copper production, including that of Braden, during April was 3,528,000 lb., comparing with 5,852,000 lb. in March, 5,292,000 lb. in February, and 10,040,000 lb. in January. Production for April, 1918, was 5,794,000 lb.; in 1917 it was 7,180,000 lb., and in 1916 10,500,000 pounds.

ARIZONA

Cochise County

BENSON SMELTERY well advanced in construction and is to be blown in within 60 days. Enough ore pledged to operate plant for two years. C. E. Goetz, of Benson, promoter.

SHATTUCK ARIZONA (Bisbee)—April production was 57,360 lb. of lead. No copper, silver or gold was produced. Production four months ending Apr. 30 was: Copper, 1,000,844 lb.; lead, 736,274 lb.; silver, 44,129 oz., gold, 160.06 ounces.

ARIZONA MIDDLEMARCH COPPER (Pearce)—Struck rich copper ore at this property, nine miles west of Pearce. Drifted in ore for 35 ft. on 7th level; 8th level crosscut from shaft reached orebody and cut 10 ft. high-grade chalcopyrite, with ore still in face. Assays vary from 2 to 16% copper. Ore is on contact of granite and siliceous limestone on this level. Flotation mill running on ores from upper levels.

Gila County

McGILLIGAN GROUP (Payson)—Eight copper claims in Mazatzal district, purchased by Houghton, Mich., syndicate represented by Luther E. Warde.

Pima County

POCAHONTAS (Tucson)—Property in Comobabis, owned by Richey brothers, bonded to eastern company.

QUIJOTOA DISTRICT (Tucson)—Silver Virgin Co. organized to work silver deposit and install mill. A. B. Murchison, of Douglas, president; J. J. Adair, manager. Tom Day bonded gold property to New York syndicate. Jack Pinder has taken over Portis gold-silver mine. Robert Mitchell developing claims. Lowell Gold, a Bisbee corporation, preparing to start mill in Horseshoe basin on gold ore.

SAN XAVIER EXTENSION (Tucson)—Work to be resumed at once. E. G. Bush shipping two carloads 38% copper ore a week to Twin Buttes.

Pinal County

LAKE SHORE (Casa Grande)—Being developed by drilling, with prospect of large operations. Owner Leonard also has working bond on old Vekol silver mine.

REPUBLIC (Casa Grande)—Purchased by George Tweedy, former manager of Bradbury interests in Mexico.

SILVER KING (Superior)—Sinking new 1000-ft. 3-compartment shaft to 1000 level started by Contractor William O'Neal, of Lowell. Issuing $500,000 bonds to pay for development.

Yavapai County

BIG BUG COPPER (Mayer)—Ordered new surface plant, compressor and drills.

ARGONNE (Mayer)—New company has purchased 23 claims from Frank Andrews, Guy Mosley, and W. A. Murphy. Price stated, $50,000.

COPPER AGE (Mayer)—New company organized by Frank Williams and Frank Thornton to develop property.

CALIFORNIA

Inyo County

MINNIETTA (Darwin)—Leased by A. F. Flynt and A. M. Grimm, of Los Angeles. Former producer.

Lassen County

WESTWOOD REGION attracting prospectors, and some development in progress. Red River Lumber Co. started work on several claims and is considering installation of machinery.

JUNIPER (Haydenhill)—Good ore disclosed by lessees. Idle for 20 years; former producer.

Plumas County

CRESCENT (Crescent Mills)—Philadelphia Exploration Co. reopened property, closed since last August because of high costs of gold mining. A. MacDonald, of Boulder, Colo., superintendent; Herbert Whiting, assayer.

WALKER (Portola)—Flotation mill treating 200 tons daily to be enlarged. To install aërial tramway. Recent exploration by diamond drilling. Controlled by Anaconda.

San Benito County

NEW IDRIA (Hollister)—Quicksilver mines resume operation after short closedown, account of low price of metal. H. W. Gould, San Francisco, manager. New rotary kilns recently installed will be put in operation. Closing down of mines in April was first suspension of operation of New Idria since 1853, when mine was opened.

Shasta County

CONTINENTAL SILVER (Igo)—Reopened by V. V. Apperson and associates. Cleaning out 500-ft. tunnel and laying new track. Idle for 20 years. Former producer. Adjoins Chicago mine, reopened a month ago.

Sierra County

GOLD EXPLORATION CO. (Downieville)—Salt Lake City corporation optioned Sovereign quartz mines in Ladies Canyon. Is considering extensive development. Former producers.

MICHIGAN

Copper District

CALUMET AND HECLA (Calumet)—Copper production for April as follows: Amheek, 1,490,311 lb.; Allouez, 355,480; C. & H., 4,361,645; Centennial, 114,652; Isle Royale, 993,073; La Salle, 17,000; Osceola, 950,579; Superior, 74,000; White Pine, 197,373.

Marquette Range

BARNES-HECKER (Dexter)—Shaft sinking has reached a depth of more than 600 feet.

CLEVELAND-CLIFFS (Ishpeming)—Installing five new electric air compressors to replace steam-driven machines at district mines. Princeton, Gwinn, and Francis mines at Gwinn operating, and Mackinaw-Gardner mine under development.

MINNESOTA

Mesabi Range

MUNROE (Chisholm)—Fire started in "C" boiler house spread to engine house and coal docks May 13, and caused loss of $20,000. One fatality.

CANISTEO (Coleraine)—Added 40-ton locomotive Brown-Hoist crane, with 55 ft. boom, to equipment.

GENOA (Eveleth)—Completed installation of electrical equipment transferred from Deacon mine, Buhl. Deacon abandoned as worked out in February, 1919.

SPRUCE (Eveleth)—Relining and enlarging of No. 4 shaft, completed at depth of 280 ft. Reinforced concrete used. Cutting new pump station. Original shaft sunk in 1894.

PETIT (Gilbert)—Republic Iron and Steel Co. increasing force. Bray mine of same company at Keewatin employing pump and timbering crews only.

SARGENT (Keewatin)—Big open pit of Wisconsin Steel Co. makes first shipment. Thoroughly modern equipment, including a large proportion of electrical machinery. Has 10,000,000 tons ore proved. Royalty 75c. per ton, with provision for minimum annual shipment of 200,000 tons.

LINCOLN (Virginia)—Fire May 8 destroyed carpenter and blacksmith shops. Interstate Mining Co., operators.

MISSOURI

Joplin District

CARL JUNCTION—Community drilling campaign started some weeks ago proceeding steadily. So far, no good strikes made. The Community Drilling Co. pays one-half cost of drilling.

CAROLINA (Joplin)—Started new concentrator at site of Gilt Edge mine, operated 12 years ago, 13 miles south of Joplin. Edwin Bancroft, Joplin, is manager.

PFAEFFLE-KELLY (Joplin)—Started new small mill on Shifferdecker land near Joplin.

MONTANA

Broadwater County

IRON MASK (Hassel)—New crosscut tunnel in 200 ft.; will cut silver-lead-manganese vein 800 ft. depth.

Jefferson County

BALTIMORE (Boulder)—Shipping silver-lead ore to smeltery.

COMET (Boulder)—Mill to be built to concentrate silver-lead-zinc ore. Shaft 1200 ft. deep.

FREE COINAGE (Clancy)—Shipment of 30 tons last week. Amalgamated Silver Mines Co.

LEGAL TENDER (Clancy)—Small shipments to smeltery. Picked samples assaying high in silver.

LIVERPOOL (Clancy)—Old mine developed 750 ft. deep to be reopened. New hoisting plant with electric power. Fryberger & Eichelberger in charge. Eastern capital interested. Shoot of high-grade silver blocked out between 600 and 750 levels.

ANGELICA COMPANY (Wickes)—Average of 50 tons ore daily from Mount Washington tunnel. Silver-lead.

Lewis and Clark County

MONARCH MINING AND POWER CO. (Elliston)—Lumber sawed on ground for compressor and ore bins. Survey for tram completed. Surveying for pipe line for power plant. Telephone line from mine to home office in Helena.

BLUE BIRD (Helena)—Company organized to develop property in Scratch Gravel hills.

HELENA MINE (Helena)—Contracted for 200 ft. drift north from shaft on 400 level. Silver-lead ore.

NOLAN (Ophir)—Mining silver ore for shipment from tunnel.

ARMSTRONG MINE (Rimini)—Shipping gold-silver-lead ore from tunnel.

SILVER MINES (Wolf Creek)—Development in camp increasing, owing to rise in silver price. Several good showings reported.

Silver Bow County

ANACONDA COPPER (Butte)—Purchased half interest in Kit Carson claim, adjoining Anglo Saxon on west and carrying westerly extension of Anglo Saxon fissure, recently cut on the 500 of the Orphan Girl, and showing milling ore 35 ft. wide carrying 12 to 16 oz. silver. Situated in "West Side" of Butte district. Orphan Girl tonnage will be materially increased soon. Nettie property, also owned by Anaconda, is in good silver ore. Showing of silver ore at Alice mine reported good. Copper production continues at better than 50 per cent.

BUTTE & SUPERIOR (Butte)—Eight feet new ore opened east on the 1900 level of Black Rock, outside of ground in controversy with Elm Orlu interests, carrying high silver-zinc contents. Reported as one of highest-grade ore disclosures made by company for any considerable tonnage, either in sight or indicated.

DAVIS-DALY COPPER (Butte)—Crosscuts from Colorado mine and Anaconda's Belmont working have "holed." Crosscut driven from the 2500 of Colorado for ventilation and affording exit has taken over a year's time under adverse conditions, it being necessary to drive 2000 ft. Ventilation has been chief problem, and connection with Anaconda workings will make property an "upcast," with strong current of air flowing throughout workings. No. 15 Sorocco fan will be installed at opening of crosscut on Anaconda level. Davis-Daly has opened 2½ ft. ore on 2300 level showing high in copper.

NEVADA

Lincoln County

PIOCHE DISTRICT ore shipments for week ended May 8 were: Prince Consolidated, 22 cars; Virginia-Louise, 7 cars; Harney, 2 cars; Black Metals, 2 cars.

COMBINED METALS (Pioche)—Assessment of 2c. per share levied. Ore shipped to date has contents valued at $392,113.45, and yielded $75,178.23 net smelter returns, which has been spent in performing 4350 ft. of development. Ore reserves total 150,000 tons, averaging .04 oz. gold, 8.26 oz. silver, 8.27% lead and 18.15% zinc. Owing to intimate association of lead and zinc in a form preventing separation by concentration, planning to erect special process smeltery, to recover both metals simultaneously in marketable material, for use as pigments.

Mineral County

SIMON LEAD MINES (Mina)—Engaged in extensive development; expects to crosscut vein at 400 level. Ore tests and plans for mill incomplete. Situated 23 miles east of Mina. Ore, lead-silver, with some zinc.

Nye County

EAST DIVIDE EXTENSION (Divide)—Powerful surface equipment being installed to prospect at depth East Divide fissure.

NEW MEXICO

Grant County

HATCHET OIL AND DEVELOPMENT (Hatchita)—Incorporated with a capital of $250,000; to drill in southern Grant County for oil. R. A. Smith, W. C. Ammerman, E. S. Plumb, and others, interested.

CHINO (Santa Rita)—Have 12 steam shovels stripping overburden.

Luna County

BLACK CAP (Deming)—Case of Birchfield vs. Warren, Hoagland, Stickney to dispossess defendants from sections of Government grazing land in the Little and Big Florida mountains, claimed by Birchfield, decided in favor of defendants. Claims have been held by Birchfield since 1905. Property was worked for manganese by Warren and others during the war. It also carries vein of 10-oz. silver ore. Developed by 100-ft. shaft. Will continue development.

WEST & CASE (Gage)—New strike, 8-in. vein assaying high silver-lead contents and 0.04 oz. gold. Three miles south of railroad. Will have 30-ton car ready to ship June 1.

DODD-WARREN (Tres Hermanos)—Will put shafts in safe condition so examination may be made.

OKLAHOMA

Miami District

SILVER FOX (Baxter, Kan.)—Annual election of officers held. B. J. Conley, Kingfisher, Okla., president; Frank Childress, Galena, Kan., vice-president and manager. Mill operating since August, 1918, and company made good profit, despite poor zinc ore prices.

VICTORY (Picher) — Developed good lead property in new shaft put down on northeastern part of Commonwealth lease. A. E. Bendelari, manager.

Tulsa County

SINCLAIR OIL AND GAS (Tulsa)—Purchased Liberty Tower Bldg., corner Liberty and Nassau Sts., New York, for reported consideration of $2,100,000. Building is 31 stories. Present offices, 120 Broadway.

TEXAS

B. F. YOAKUM and associates will develop oil lease holdings in Central West Texas fields and reported will build refinery at Dallas or in vicinity.

Bexar County

HELVETIA COPPER CO.'S oil lands, situated 20 miles south of San Antonio, are reported to be producing oil. Well down 1600 ft.; casing became wedged, preventing seepage of oil into drill pipe, and therefore producing only six barrels daily. Expects to start further drilling when four churn drills arrive. Intend calling assessment of $1 per share, but treasury surplus at present sufficient for immediate needs. C. C. Prindle, president; R. H. Gross, of East Butte Copper Co., treasurer; W. A. Paine, president Copper Range Co., and R. M. Bennet interested. Company owns copper properties in Pima County, Ariz., with ore said to be of refractory nature.

Brazoria County

CROWN OIL AND REFINING (West Columbia)—Marmion No. 2 well brought in May 7 at depth of 3100 ft. Initial flow, 3000 bbl. a day, with considerable water. Well capped until storage facilities provided.

Freestone County

TYTHE OIL AND GAS, of Corsicana, leased large acreage near Fairfield recently. Other oil companies leased ground near by; drilling will begin soon.

Hardin County

NEW WELLS AT SOUR LAKE brought in as follows: Lake Graham Oil Co., 200-bbl. pumper; The Texas Co., well No. 113, 150-bbl. pumper.

Harris County

GULF PRODUCTION (Goose Creek)—No. 18 Wright-A well now making 500 bbl. a day, with air lift. No. 12 Stateland is dry at 3100 feet.

GULF COAST OIL (Goose Creek)—Gaillard No. 10 brought in at 2923 ft., flowing 175 bbl. a day, with 10% water.

Liberty County

REPUBLIC PRODUCTION (Hull)—Continue production from pumping wells following notification Sun Pipe Line Co. would take part of Republic's production in Hull field. Daily production of field for last week about 1000 barrels.

UTAH

Iron County

BIG FIVE MINING (Lund)—Coal land covering 320 acres and 25 iron claims reported sold for good price to California people. Land lies along route of proposed railroad of Old Capitol Petroleum and Fuel Co., to run between Lund on S. P. L. A. & S. L. R. R. and Cedar City.

Juab County

APEX STANDARD (Eureka) — Shaft down almost 700 ft. Well equipped. Southeast of Tintic Standard and east of Iron King.

CENTENNIAL-EUREKA (Eureka) — Reported some lead ore found on 2000 level. Deepest workings.

EUREKA BULLION (Eureka) — Strike on 800 level near Tintic Standard. J. M. Bestelmeyer, locater of Tintic Standard, manager.

EUREKA MINES (Eureka) — Strike made on 1000 level by lessees. Company doing work in search of this ore on 1100.

GODIVA (Eureka) — Preparations for deeper mining being made.

MAY DAY (Eureka)—Considering development to 1500 to 1800 ft. Arrangements probable to work through shafts of neighboring properties.

PLUTUS (Eureka)—Controlled by Chief Consolidated. Shows machinery and improvements valued at $500 in report to Board of Equalization.

TINTIC DRAIN TUNNEL (Eureka)—Tunnel starting from eastern side of Tintic Mountain, few miles southwest of Goshen and Elberta, in about 2600 ft. Monthly progress 175 to 200 ft., with force of 30 men working. To unwater large mining area, as well as provide irrigation. Jesse Knight interested.

TINTIC STANDARD (Eureka)—Net proceeds 1918 amounted to $638,944.

TINTIC MILLING (Silver City) — No action by directors in regard to installation of cyanide tanks and complementary equipment for treatment of gold ores. Recovery not great at present, and no ores carrying much gold accepted. Large tonnage of ore of this character not available in district.

Piute County

ALUMINUM POTASH COMPANY OF AMERICA (Marysvale)—Mine buildings being put up five miles north of Marysvale in Sevier Canyon. Mill to be built. Property includes Copper Butte claims. G. M. Winkleman, president.

Salt Lake County

LITTLE COTTONWOOD TRANSPORTATION (Alta)—Narrow-gage road clear and ore shipments from South Hecla and Columbus-Rexall to begin immediately.

UTAH COPPER (Bingham)—Ore milled first quarter 1919 amounted to 1,526,500 tons, from which 28,971,089 lb. copper obtained. Extraction 74.70% and cost 13.72c per lb. Total, with 36,016 lb. direct shipping ore added, 29,261,208 lb. Figures compare with 3,047,400 tons milled last quarter 1918, from which obtained 48,303,692 lb. copper; total—with 254,104 lb. direct shipping ore added—49,238,076 lb. copper; average extraction, 64.43% and cost 16.42c. Net profits, $481,324, as compared to $3,331,728 last quarter 1918.

CARDIFF (Salt Lake)—Most of surface snow off road up Big Cottonwood Canyon to mine, but passage of trucks not yet feasible, owing to slides.

Summit County

ONTARIO SILVER (Park City)—Pumps still working. Reported committee of employees to meet with management in regard to strike.

WASHINGTON

Ferry County

LAURIER MINING CO.'S property near international boundary has been leased by G. A. O'Neal and partners. Has yielded fair returns in copper and silver.

QUILP (Republic)—Shipping steadily about five cars weekly to Tacoma smeltery.

Okanogan County

GREAT METALS, M. AND M. (Nespelem) — Constructed 100-ton mill last year at falls on Nespelem River, about three miles from Nespelem, now reporting good recovery in re-treating old dumps for gold and silver. Water concentration and flotation used.

Snohomish County

SUNSET COPPER (Index)—Dewatering preparatory to resuming operations. For last two years has been most consistent shipper in Cascade region. Suspended operations few months ago when copper prices declined. Operates 150-ton mill. W. W. Pitt, superintendent.

CANADA

British Columbia

CONSOLIDATED M. AND S. (Trail)—Announced cut of 45c. per ton in treatment of ores. Change of rate based on change in wage scale and price of coke.

Ontario

MILLER INDEPENDENCE (Boston Creek)—Planning 100-ton mill.

ADANAC (Cobalt)—Arranging to treat low-grade ore in Temiskaming mill.

FOSTER (Cobalt)—Resumed operations after short shutdown.

TEMISKAMING (Cobalt) — Negotiating for Cochrane property, adjoining.

PALMER PAINE (Gowganda)—Formed to operate T. C. 177, a well-known claim near Miller Lake-O'Brien.

CLIFTON PORCUPINE (Porcupine)—Formed to operate Porphyry Hill, which shipped number of cars of profitable ore from narrow vein.

DAVIDSON (Porcupine)—Developments satisfactory. Ore from new vein put through five-stamp mill.

M'INTYRE (Porcupine)—Sinking to 1350 feet.

KEELEY (South Lorraine)—To be reopened. Worked spasmodically for years.

MEXICO

NEW RAILROAD, to traverse section of northern Mexico between Cuatro Cienegas and Sierra Majada, about 110 miles, according to report, has been under construction for several months. It is a government project, primarily intended to give employment to natives. Line is expected to be in operation by next December. It is an extension of the branch line of National Railways of Mexico, which runs from Monclova to Cuatro Cienegas.

RENEWAL OF CONCESSIONS which were granted under the late President Diaz, but cancelled under the Carranza government for non-fulfilment of contract, have been applied for to the Department of Commerce and Industry. The concessions were granted to Americans and other foreigners for the installation of hydro-electric plants and development of water-power resources. Complete survey of available sites and amount of horsepower to be generated is planned by the government.

Sonora

DOS CABEZOS (Nuevas Cases Grandes)—Property leased by Frank Wheelan, of El Paso. Will start work at once. Owned by W. E. Pearson; idle four years.

PROMONTORIO (Alamos)—Has opened 14 ft. ore on 400 level. Treating 50 tons daily in Lane mill, producing 10 tons concentrates. Ore is silver-lead. Completed truck road to Alamos, eight miles. Carlos Grosbeck, manager.

SAN MANUEL (Alamos)—Made first payment on purchase price of $50,000; getting good grade ore on 200 level. Amos Yeager and others, of Nogales, Ariz., new owners.

PERU

Junin

CERRO DE PASCO (Morococha)—April production, according to cable advices, was 2,780,000 lb. blister copper.

The Market Report

SILVER AND STERLING EXCHANGE

May	Sterling Exchange	Silver New York, Cents	Silver London, Pence	May	Sterling Exchange	Silver New York, Cents	Silver London, Pence
15	4.6575	1.11	53¾	19	4.6506	1.09'	53¼
16	4.6538	1.11¼	54	20	4.6200	1.08¼	52⅞
17	4.6525	1.10⅞	53½	21	4.6200	1.04⅛	51

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

May	Copper Electrolytic	Tin Spot.	Lead N. Y.	Lead St. L.	Zinc St. L.
15	15.85	†72½	5.00 @5.05 5.00	4.70 @4.75 4.75	6.10 6.12½
16	16.10	†72½	@5.10	@4.80 4.85	@6.17½ 6.15
17	16.10	†72½	5.10	@4.90 4.90	@6.20 6.20
19	16.35	†72½	5.25	@5.00 5.00	@6.25 6.25
20	16.35	†72½	5.25	@5.05 5.00	@6.30 6.25
21	16.35	†72½	5.25	@5.05	@6.30

† Government price.

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other special shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis.

LONDON

May	Copper Standard Spot	Copper Standard 3 M.	Copper Electrolytic	Tin Spot	Tin 3 M.	Lead Spot	Lead 3 M.	Zinc Spot
15	77½	77⅜	81	237	234	24⅜	24⅜	35½
16	78	78¼	81½	242	237½	24⅜	24⅜	35¾
17								
19	79¼	79⅛	82	246½	242½	24⅜	24⅜	36
20	79⅛	79⅜	82	245	241½	24⅜	24⅛	36
21	79⅜	79⅛	82	239	237	23½	23⅜	36

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb.

Metal Markets

NEW YORK—May 21, 1919

This week was noteworthy for further sharp advances in copper, lead, and zinc, and the transaction of large business in each of these metals, but particularly in copper.

The flurry in silver passed away, and the price relapsed. The causes for the recent advance centered in London, in which market there was buying for coinage purposes and speculative short-covering. The Orient was not a buyer. A recent event that has passed without notice was the raising by the Indian government of the value of the rupee from 18d. to 20d. If the Indian government could previously be a buyer of silver at about $1 per oz., apparently it is in a position to buy now at an advance of about 10% without disturbing exchanges.

At a recent meeting in the office of the Director of Sales, War Department, it was reported that the several branches of the War Department had the following supplies of scrap brass and unused munitions: 31,907 tons of brass in the form of ingots, rods, sheets, etc.; 33,000 tons of field artillery cases; 1000 tons of cartridge cases; and 2939 tons of brass scrap. Some of this material is high grade brass and some of it is leaded brass.

Ocean freights to British ports remain at 1c. per lb. and trans-Pacific freights at $15 per ton.

Copper—Very large business was transacted this week, larger than in the previous week. As heretofore, this was mainly for domestic account, and was mainly with wire-drawers. However, some brass-makers bought relatively small quantities. The bulk of the business was for May-June delivery, but there were more July contracts written than in the previous week, and some sales were made for August delivery. The common custom among the selling agencies now is to enter into two months' contracts, and July and August business is regarded as forward business, for which premiums are asked. However, sellers are not united in such a construction, and a considerable part of the July business of this week was taken on the same terms as May-June.

Some export business was done this week, especially for shipment to Japan, whither shipments are naturally made from Tacoma. The British market is below our parity. At the beginning of the week copper was reported sold in London at £80¾, which would correspond to about 15½c. here. Later £83, equivalent to a little less than 16c., f.o.b., New York, was quoted. At the close, London quoted spot at £83, and futures at £82.

In this market the week began with copper firmly on the basis of 16c., delivered, regular terms, or 15.85c., cash, New York. The largest part of the sales was made at that price, and the volume of business done on Thursday was so great that all producers advanced ¼c. on Friday. Although the volume of business fell off somewhat, it remained so large that a further advance of ¼c. on Monday was considered to be justified, and business aggregating millions of pounds was done on the basis of 16.35c., New York. During Tuesday and Wednesday, however, the inquiry waned distinctly, and, although producers were very firm in their terms, the market seemed to have rather a tired look.

The Japanese buying of copper in this market has been mysterious. It is well known that the cost of producing copper in Japan has increased very seriously, but the statistics of production and exports show that Japan must have begun this year with a large stock of copper, and we know the Japanese producers have been underselling us in England.

Some of the important copper mines of Australia have been closed, owing to inability to operate profitably under present conditions. There is a considerable accumulation of electrolytic copper at Port Kembla and stocks of crude copper elsewhere.

Copper Sheets—The base price of copper sheets is 24c. per lb. Copper wire is quoted at 18¼c. per lb. f.o.b. mill, carload lots.

Tin—There is nothing new to report with respect to the domestic market.

Lead—In our report of last week we recorded the firmer tendency in lead, even then exhibited by advanced quotations. This resulted primarily from increased demand for the metal. The largest producers had been standing aloof, leaving the market to the rest of the producers, some of whom led the way in depressing prices by their offerings so long as demand was dull. With improving demand, they changed their minds, and, withdrawing their pressure, the price advanced quickly. However, there was not a general acquaintance with the situation, and some large business was accepted by one or more producers on Friday morning at 5c., just before the A. S. & R. Co. raised its price to 5.10c. On May 19 the A. S. & R. Co. again raised to 5¼c., and has sold freely at that price, although other producers have asked a little more and have obtained it on some small business. A contributory factor to the advance was probably the feeling that such lead as is still held by the Government would cease to be a menace.

Business in lead this week attained considerable proportions. The manufacturers of blue-lead products were large buyers, and some purchases were made by cable manufacturers. The consumption of lead by the corroders has been pretty good right along.

The situation with respect to Mexican lead has been relieved by some substantial sales for export.

Zinc—This market advanced sharply, partly on speculative buying and partly on buying by consumers. Galvanizers and brass-makers were rather conspicuous by their absence, but some sales were made to sheet-rollers and there were some sales for export. A rather fair business in high-grade zinc was done, sales of this metal being made at 6⅞@6¾c. The report that the Government was offering high-grade zinc at 6¾c. became a disconcerting factor, however, and was regarded as curious, in view of the pending negotiations between the Government and the producers for the latter to take over the stocks, which negotiations were regarded as being close to consummation.

Speculative interest in the zinc market was reflected by the premium of about 0.5c. that was paid for forward deliveries.

Zinc Sheets—The quoted price of zinc sheets is $10 per 100 pounds.

Other Metals

Aluminum—31@32c. per pound.

Antimony—The sharp advance in this market was a consequence of the rise in the price for silver, the Chinese and Japanese producers advancing their prices, although the stocks of the metal in this country are still believed to be considerable. At the close we quote spot at 7¾@8c. Futures are not freely offered, but 7¾c. is quoted nominally.

Bismuth—Metal of the highest purity for pharmaceutical use is quoted at $3.20 per lb. for wholesale lots—500 lb. and over.

Cadmium—Quoted at $1.40 per lb. in lots of 500 pounds.

Nickel—Ingot, 40c.; shot, 43c.; electrolytic, 45c. per pound.

Quicksilver—Supplies in this market are still short. We quote $82. San Francisco telegraphs $78, strong.

Silver and Platinum

Silver—The market for silver this week has been unsettled and reactionary, selling down from 53¾ to 51d. Buyers have held back, looking for still further decline. India has not responded to the advance, and therefore sufficient support to sustain the higher prices has not been forthcoming.

Exports for the week ended May 17 were 956,000 ounces.

Mexican dollars at New York: May 15, 84; May 16, 84; May 17, 84; May 19, 83; May 20, 82; May 21. 79½.

The general stock of money in the United States on May 1, 1919, totaled $7,614,699,260; of this, $3,092,430,916 was in gold coin and bullion, $311,018,930 in standard silver dollars, and $243,896,606 in subsidiary silver. The money in circulation on May 1 was $5,863,288,091, or $54.64 per capita. On May 1, 1918, the per-capita circulation was $50.37.

Platinum—Refined ingot is quoted at $105.

Palladium—We quote $115@120, sales being reported at both these figures.

Zinc and Lead Ore Markets

Joplin, Mo., May 17—Blende, per ton, high, $40.40; basis 60% zinc, premium, $38; Prime Western, $37@36; sludge and flotation, $35@32; calamine, basis 40% zinc, $25@22. Average settling prices: Blende, $35.29; calamine, $23; all zinc ores, $35.

Lead, high, $62.80; basis 80% lead, $55; average settling price, all grades of lead, $55.10 per ton.

Shipments the week: Blende, 12,438; calamine, 236; lead, 1573 tons. Value, all ores the week, $531,190.

The forced closing down of mines, on the account of the low price of spelter and zinc ore, is creating a disconcerting influence upon producers. Some who are still trying to make expenses assume that it would be better to cease mining entirely. A general closing down during harvest is talked about. After that, if the metal and ore outlook does not improve, many intend to quit the business. The large majority of Missouri mines have long ago been abandoned, and may never again be opened. If the Oklahoma field is closed the same fate may befall that part of the district.

Platteville, Wis., May 17—Blende, basis 60% zinc, $39 base both for premium grade and high-lead grade.

No sales of lead ore are reported. Shipments reported for the week are 1991 tons blende, 30 tons galena, and 726 tons sulphur ore.

For the year to date the totals are 37,771 tons blende, 1857 tons galena, and 4628 tons sulphur ore. During the week 2676 tons blende were shipped to separating plants.

Other Ores

Manganese Ore—Charles Hardy reports the following: "While it is possible to dispose of spot lots of manganese at around 50c. per unit delivered, furnace, it seems almost impossible to enter into any contract for future delivery. Some time back, however, we were told of very low prices ruling for Indian ore, but these low prices were not borne out by offers received from abroad. The lowest quotation that we have come across during the week for Indian ore for shipment was 65c. per unit, while the Brazilian oré is quoted at 32c. per unit, f.o.b., and this price with the present freights prevailing would be far in excess of 65c." Stocks are still high at buyers' works.

Molybdenum—Some dealers report no inquiry, while others report a little. We quote 65@75c.

Tungsten Ore—There was a fair inquiry, and some business was done. Chinese ore was quoted at $6.50@7; for Bolivian ore, $9@10 was asked, but no business in that ore was reported.

Other Minerals

Pyrites—Spanish pyrites is quoted at 20½c. per unit for furnace ore, c.i.f. New York or other Atlantic port.

Iron Trade Review

PITTSBURGH—May 20

In practically all finished-steel products except tin plate there is a distinctly marked improvement in buying. Orders are small individually, as formerly, and buyers show their lack of confidence in prices by placing orders only for material that is urgently needed. This however, represents a healthy condition from the standpoint of producers, who are beginning to become sanguine and to hope that in the near future there will be heavier mill operations. Until a week or two ago, there had been a constant decrease in operations, due to the gradual exhaustion of old orders. The increase in new buying may possibly counterbalance the completion of old business. Several of the independents are operating at better rates than last week or the week before, but Steel Corporation operations, which have regularly been higher than independent mill operations since the first of the year, continue to decrease.

Lettings of fabricated steel orders in April represented 24½% of the month's capacity, against 17½% in March, 12½% in February, and 12% in January. A large quantity of such work has been figured upon, but it is only in the case of small jobs that there are lettings, investors in large projects apparently preferring to wait.

A careful canvass of the railroad situation has been made by steel interests, resulting in the conclusion that the railroads are not in urgent need of buying steel products during the next few months. Though some roads are bare of supplies, others have more than are necessary, and by various exchanges the Railroad Administration will be able to avoid buying much steel. Action has not been taken as to the 200,000 tons of rails recently inquired for, but the prospect seems to be that purchases will not be made at this time. There is an unconfirmed rumor that the French government is about to close with the Steel Corporation for 400,000 tons of rails, arrangements having to be made for banking accommodations to carry payments over a considerable period. Generally there is an improvement in export business, which has been light for months. The fairly large exports reported monthly are chiefly on old orders; much of the material had been rolled and was awaiting shipping accommodations at the ending of hostilities.

The large steel producers are with scarcely an exception adhering rigidly to the prices of Mar. 21. There is cutting, ranging up to $2 per ton, or possibly more, in many products, chiefly by small mills, also by a Western interest, whose cutting under the Pittsburgh basis is viewed as a surrender of part of the freight advantage arising from location. Indications are that there will be no general break in the market, at least in the near future, and there has been such a change in judgment in the last few weeks that some observers now think a general buying movement can start from the present price level.

Pig Iron—No improvement in the demand for pig iron is to be recorded, purchases being only of small tonnages, for immediate shipment. Even on such business there are occasional price irregularities. The melt of foundry iron is believed to have increased of late, and stocks in consumers' hands have decreased considerably. Many merchant furnaces have gone out, and those still in blast are accumulating little iron. The probability is that more merchant pig iron is being consumed than is being made. Though the market is soft, it is quotable at Mar. 21 prices: Bessemer, $27.95; basic, $25.75; malleable, $26.25; foundry, $26.75; forge, $25.75, f.o.b. Valley furnaces, freight to Pittsburgh being $1.40. One furnace with $1.10 freight to Pittsburgh quotes these same prices at furnace, and there may be other cases of the sort, so that the Pittsburgh market is not at the full Valley equivalent.

Steel—Rumors continue of shading of billet, sheet bar and slab prices by $1 to $2 a ton, but these have not been fully confirmed, and all or nearly all the large producers are adhering strictly to regular prices. Irregularities seem to be confined to small producers of openhearth steel. We quote: Billets, $38.50; sheet bars and small billets, $42; slabs, $41, f.o.b. Pittsburgh or Youngstown. Rods are firm at $52, Pittsburgh.

Ferromanganese— The market on resale 80% ferromanganese continues quotable at about $110, delivered, though a few sales have lately been made at less, sometimes at much less, the seller apparently not knowing what could be secured. The producers' asking price continues at $150, delivered. The British c.i.f. price is £25, equal to about $116 at the Atlantic seaboard, but there is no buying even at that figure, which is interesting chiefly as an indication of the future of the market, as the cost of production is undoubtedly lower in the United States than in Britain. Spiegeleisen continues nominal at $33@35 for 18% resale, there being no transactions.

Coke—The spot furnace coke market has stiffened further, the usual quotations being $4. This could be shaded, but perhaps not by as much as 25c., whereas a few weeks ago sales were made at $3.50@3.60. May settlements on monthly adjustment contracts were generally made at $4, and this figure will probably obtain for June. Furnacemen and coke operators are beginning to sound each other out on second-half contracts. Operators are disposed to ask $4, and in some cases $4.25, for second half, but furnaces are hardly likely to start the bidding at over $3.50. Production in the Connellsville and Lower Connellsville region is now about 100,000 tons per month, or a shade more, whereas during the major part of last year production ran well over 300,000 tons, and a few years ago a rate of 425,000 tons a month was maintained for a year. Much of the decrease of consumption falls upon the Connellsville region, byproduct operations remaining at close to capacity.

MONTHLY AVERAGE PRICES OF METALS

	Silver	New York			London		
		1917	1918	1919	1917	1918	1919
Jan.		75.630	88.707	101.125	36.685	44.356	48.438
Feb.		77.585	85.716	101.125	37.742	42.792	48.027
Mar.		73.861	88.082	101.125	36.410	43.620	48.171
April		73.875	95.346	101.125	36.963	47.215	48.886
May		74.745	99.505	.....	37.940	48.980	.....
June		76.971	99.500	.....	39.065	48.875	.....
July		79.010	99.625	.....	40.110	48.813	.....
Aug.		85.407	100.292	.....	43.418	49.077	.....
Sept.		100.740	101.125	.....	50.920	49.500	.....
Oct.		87.332	101.125	.....	44.324	49.500	.....
Nov.		85.891	101.125	.....	43.584	48.969	.....
Dec.		85.960	101.125	.....	43.052	48.492	.....
Year.		81.417	96.772	.....	40.851	47.516	.....

New York quotations cents per ounce troy, 999 fine London, pence per ounce, sterling silver, 925 fine.

STOCK QUOTATIONS

N. Y. EXCH.†	May 20
Alaska Gold M.	4
Alaska Juneau	2½
Am.Sm.&Ref.,com.	78
Am.Sm. & Ref., pf.	‡109
Am.Sm.Sec., pf., A.	‡93
Am. Zinc	16½
Am. Zinc, pf.	‡48
Anaconda	67½
Batopilas Min.	12
Bethlehem Steel	‡75
Butte & Superior	25
Butte Cop. & Zinc	2¾
Cerro de Pasco	44⅛
Chile Cop.	23½
Chino	38⅛
Colo. Fuel & Iron	46½
Crucible Steel	74⅛
Crucible Steel, pf.	*91
Dome Mines	15
Federal M. & S.	15⅛
Federal M. & S., pf.	43
Great Nor., ore ctf.	46
Greene Cananea	41⅛
Gulf States Steel	70
Homestake	‡83
Inspiration Con.	54⅛
International Nickel	26⅛
Kennecott	34⅛
Lackawanna Steel	78⅛
Mexican Petrol.	181⅛
Miami Copper	27⅛
Nat'l Lead, com.	‡75
National Lead, pf.	‡108
Nev. Consol.	17⅛
Ontario Min.	8⅛
Ray Con.	21⅛
Republic I.&S.,com.	86⅛
Republic I.&S., pf.	103⅛
Sloss-Sheffield	58
Tennessee C. & C.	15
U. S. Steel, com.	102⅛
U. S. Steel, pf.	115⅛
Utah Copper	78
Va. Iron C. & C.	‡63⅛
Worthington Pump	68

BOSTON CURB*	May 20
Boston Ely	1⅛
Boston & Mont.	.67
Butte & Lon'n Dev.	.12
Calaveras	1
Chief Con.	3⅛
Contact	.05
Corbin	‡.25
Cortez	.5
Crown Reserve	.35
Crystal Cop.	.16
Eagle & Blue Bell	2⅞
First Nat. Cop.	1⅛
Gadsden Cop.	⅜
Houghton Copper	.50
Intermountain	‡.05
Iron Blossom	.38
Iron Cap	10½
Majestic	.19
Mexican Metals	.17
Mines of America	‡.05
Mojave Tungsten	.23
Nat. Zinc & Lead	.13
Nevada-Douglas	.15
New Baltic	1
Oneco	.50
Pacific Mines	‡.25
Rex Cons.	.14
Yukon Gold	.75

SAN FRAN.*	May 13
Alta	‡.08
Andes	.39
Best & Belcher	.35
Caledonia	.24
Challenge Con.	‡.03
Confidence	.25
Con. Virginia	2.70
Gould & Curry	.12
Hale & Norcross	.26
Jacket-Cr. Pt.	.25
Mexican	.62
Occidental	.40
Ophir	2.00
Overman	.10
Savage	.19
Sierra Nevada	.19
Union Con.	.40
Utah Con.	‡.04
Belmont	3.50
Jim Butler	.44
MacNamara	1.15
Midway	.51
Mont.-Tonopah	.25
North Star	.10
Rescue Eula	.24
West End Con.	2.62½
Atlanta	.04
Booth	.13
Comb. Frac.	.07
Florence	.45
Jumbo Extension	.14
Kewanas	.04
Nevada Hills	.07
Nevada Packard	.19
Round Mountain	.30
Silver Pick	.09
White Caps	.23

COLO. SPRINGS*	May 13
Cresson Con.	4.50
Doctor Jack Pot	.03
Elkton Con.	.05
El Paso	.18
Gold Sovereign	‡.02
Golden Cycle	1.79
Granite	.14
Isabella	.05½
Mary McKinney	‡.07½
Portland	.95
United Gold M.	.16½
Vindicator	.30

BOSTON EXCH.†	May 20
Adventure	‡.50
Ahmeek	74
Algomah	.60
Allouez	37
Ariz. Com.	12½
Arnold	‡.20
Bingham Mines	9⅛
Bonanza	.20
Butte-Balaklava	‡.65
Calumet & Ariz.	64½
Calumet & Hecla	400
Carson Hill	13⅛
Centennial	13
Copper Range	44½
Daly West	3½
Davis-Daly	6½
East Butte	9⅛
Franklin	2½
Granby	‡66½
Hancock	5
Hedley	‡12
Helvetia	5½
Indiana	‡.50
Isle Royale	28½
Keweenaw	‡1½
Lake	4
La Salle	2½
Mason Valley	3½
Mass	5⅛
Mayflower	6½
Michigan	6
Mohawk	59½
New Arcadian	2½
New Cornelia	17½
New Idria	9
Nipissing	12
North Butte	11⅛
North Lake	.51
Oilbway	3⅛
Old Dominion	34½
Osceola	51
Quincy	61
St. Mary's M. L.	48½
Santa Fe	‡.25
Seneca	24
Shannon	3
Shattuck-Ariz.	‡11
So. Lake	1½
So. Utah	.25
Superior	6½
Superior & Bost.	2½
Trinity	3½
Tuolumne	.99
U. S. Smelting	65⅛
U. S. Smelting, pf.	49½
Utah Apex	3
Utah Con.	10½
Utah Metal	1⅛
Victoria	‡2
Winona	.99
Wolverine	18½

N. Y. CURB†	May 20
Am. Tin & Tung.	‡⅛
Big Ledge	⅛
Butte & N. Y.	‡.50
Butte Detroit	‡.04
Caledonia	.39
Calumet & Jerome	‡⅛
Can. Cop. Corpn.	1⅞
Carlisle	‡2
Cashboy	.10½
Con. Ariz. Sm.	⅜
Con. Coppermines	‡5⅛
Goldfield Con.	.16
Goldfield Merger	.05
Hecla Min.	5½
Howe Sound	5½
Jerome Verde	‡⅛
Louisiana	‡⅛
Magma	‡31
Marsh	.08
McKinley-Dar-Sa.	.60
Milford	‡.75
Mother Lode	.42
Nixon Nevada	.21
Ohio Cop.	‡.50
Rawley	‡2½
Ray Hercules	2
Richmond	‡.50
Rochester Mines	.23
St. Joseph Lead	‡13
Standard S. L.	⅞
Stewart	.32
Success	‡.05
Tonopah	‡4
Tonopah Divide	8⅛
Tonopah Ex.	3
Tribullion	‡.25
Troy Arizona	‡.10
United Eastern	‡4⅛
United Verde Ext.	‡.36½
United Zinc	.25
Utica Mines	‡.08

TORONTO*	May 20
Adanac	.22
Bailey	.03
Beaver Con.	.45
Chambers Ferland	2.00
Coniagas	.04
Hargraves	‡5.75
Kerr Lake	.50
La Rose	1.00
Lake Shore	2.00
Min. Corp. of Can.	.08
Peterson Lake	.18
Teck-Hughes	.40
Temiskaming	.03
Wettlaufer-Lor.	‡.68
Davidson	.40
Dome Exten.	.20
Dome Lake	7.00
Hollinger	1.75
McIntyre	.12½
Newray	.20
Porcu. Crown	.20
Vipond	.13
West Dome	.....

*Bid prices. † Closing prices. ‡ Last quotations.